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Modern Mining Methods.

"Mining methods" is a subject always of interest to the miner, and in the United States, where the wage rate is relatively high as compared with that of Europe and most Spanish American countries, certain methods employed in those countries are only mechanically applicable in America, as their employment here is rendered inexpedient, owing to cost of labor. This fact has rendered the square set system of timbering indispensable to American mines. In fact there are many large ore bodies that could not without great danger and probable loss of ore be extracted by any other method. This system is elastic and can be so adjusted as to meet almost any condition, but to insure the greatest good it must be properly applied. That the square set can be put in roughly and still be expected to meet all requirements is a mistake. It must be placed with great care and absolute exactness to insure the best results. In only a few mines is it not necessary to fill the stopes as fast as timber is put in place. A notable exception was the Ophir mine on the Comstock where P. Deidesheimer first introduced the system, it being really the outgrowth of the necessities of the case. In this mine Mr. Deidesheimer extracted a stope 400 feet high, 90 feet wide and 320 feet long, the entire excavation being filled with square sets, the whole presenting as much regularity of appearance as the steel frame of a great modern building in course of construction. The work was well done, however, and the greatest care was taken that all wedges be tightly driven, allowing the ground no opportunity to start. This stope was extracted and timbered in 1861, and was filled from the surface in 1862. It was a thoughtfully planned and carefully executed piece of mine engineering, under almost ideal conditions, but these ideal conditions are rarely found and filling must be resorted to promptly. There are few stopes of such magnitude as that of the Ophir that will stand a year without filling. The greater number demand that filling be carried on contemporaneously with ore extraction and timbering.

When agitation was made some years ago for a much needed Cabinet department of mines and mining, the movement was partially sidetracked by the

suggestion from sundry Western Senators that a "bureau of mining" could or would be embodied in the to-be-created Cabinet department of commerce. The bill creating the Cabinet department of commerce comes up next week for the consideration of Congress, but among the many "bureaus" it is designed to embrace there is no mention of mining or metallurgy. Meanwhile there is a growing need for a Cabinet department of mines and mining, and nothing less will give proper representation to that great national industry.

Old and New Methods in Mexico.

Nothing, perhaps, can better illustrate the advance of modern ideas into the mining districts of Mexico than the two half-tones appearing on this page. One is a heavy, ungraceful structure of wood,

standing at the collar of the old Valencia shaft at Guanajuato, the other a graceful steel frame, erected at the Real Del Monte mine, in Pachuca, State of Jalisco. The latter illustrates the adoption of modern American methods, structures and machinery. The former, however, conveys little idea to the observer of the character of the great shaft over which it stands at Guanajuato. The shaft is vertical, circular in form, 30 feet in diameter, 1600 feet deep, and walled with masonry from top to bottom—a remarkable piece of engineering to be accomplished by any people in any age.

Most interesting to contemplate is the remarkable changes and improvements made in metallurgical processes and machinery within the past twenty-five years. This is more particularly noticeable and important in smelting. Furnaces have been changed in form and have grown in size until the lead or copper furnace of a quarter of a century ago looks like a pigmy beside one of modern type. The hard and fast "laws" governing the technology of smelting have been displaced by newer and better methods, and to-day smelters are successfully operated with a less percentage of lead, or of copper, and with lighter fuel charges than ever before. Copper mattes are now made containing no more than 5% copper, which has taken up practically all the precious metal in the ore. At well appointed works everything is done on a scale eclipsing the magnitude of anything attempted a few years ago. Mechanical haulage has been introduced to handle the products of the furnaces, and the tendency is still along the same lines of expansion and improvement.

In the case of the Kennedy Mining Co. vs. the Argonaut Mining Co., of California, now under consideration by the Supreme Court of the United States, one of the questions is that of jurisdiction, motion having been made to dismiss the suit for lack of jurisdiction. A decision is expected this month, when the court reconvenes.



Head Gear at Table Mountain Mine, Calaveras Co., Cal. (See Page 7.)



Head Frame, Old Valencia Shaft, Guanajuato, Mexico.



New Steel Head Frame, Real Del Monte Mine, Pachuca, Jalisco, Mexico.

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TABLE OF CONTENTS.

ILLUSTRATIONS.—Head Gear at Tahle Mountain Mine, Calaveras Co., Cal.; Head Frame, Old Valencia Shaft, Guanajuato, Mexico; New Steel Head Frame, Real del Monte Mine, Pachuca, Jalisco, Mexico, 1. Sketch Showing Relation of Sierra Nevada and Bunker Hill Lodes; Plan Showing Course of Sierra Nevada Vein; Showing Outcrop Bunker Hill Vein; Mammoth-Standard Vein Showing Fault Workings Sierra Nevada Mine; Structure Mammoth-Standard Vein, 5. Sketch Map Showing Old Workings and System of New Development; Map of a Portion of Calaveras Co., Cal., Showing Fort Mountain Channel, 7. Kinkadee Mill. Muller Lifted, 8. Ore Chute and Bins, Golden Eagle Mine, Hayden Hill, Lassen Co., Cal.; Buffalo Pitts Road Locomotive, 9. Mining and Metallurgical Patents, 10.

EDITORIAL.—Modern Mining Methods; Department of Mines and Mining; Old and New Methods in Mexico; Changes in Metallurgical Processes; Kennedy M. Co. Vs. Argonaut M. Co., 1. Searchlight of the Mountain Copper Co.; Good Luck of Some Prospectors; Advance in Manufacture of Crucible Steel; An Object Lesson in Mining Capitalization; System in Mining; Patented Metallurgical Processes; Decision in the Pennsylvania Case; Permanent Demand for Gold; The Land Department at Washington, 2.

MINING SUMMARY.—11-12-13-14-15.

LATEST MARKET REPORTS.—16.

MISCELLANEOUS.—Concentrates, 3. Use of Lime as an Alkaline Reagent in Cyaniding; Notes on Assaying; Experiences of a Working Miner, 4. The Mining Industry of the Coeur d'Alenes, Idaho, 5. Seeking Increased Water Supply; Motions of Underground Waters; New Uses for Slag, 6. An Experience in Drift Mining in Hard Cement Gravel; Raising a Smokestack, 7. The Kinkadee Mill; Economical Mining Method Required; A Study of Amalgamation Methods, With the Object of Avoiding the Loss of Mercury, 8. Vanadium; Buffalo Pitts Road Locomotive; An Ore Chute and Bins, Lassen Co., Cal.; A Type of Desert Deposit, 9. Mining and Metallurgical Patents; Portable Forge, 10. Personal; Obituary; Books Received; Catalogues Received; Commercial Paragraphs; New Patents; Notices of Recent Patents, 15-16.

THE employment of a searchlight at night at the property of the Mountain Copper Co., in Shasta county, Cal., may be considered an indication that the company anticipate trouble, but intend to forestall it as far as possible.

THE good luck of some prospectors is phenomenal. The latest to attract attention is he who in the Thunder Mountain district, Idaho, where the snow is 7 to 15 feet deep, has found a ledge half a mile long and 2000 feet wide that pans in coarse gold. A shaft was sunk 10 feet deep—presumably in the snow.

IN the manufacture of crucible steel the most notable advance is the addition of manganese, ferro-tungsten, chromium, nickel uranium, vanadium or other alloy, producing a property in the steel of requiring no heating nor subsequent cooling in water to occasion hardness, furnishing what is styled a self-hardening steel. With this tool steel of special preparation it is possible for a tool to hold its cutting edge and temper when heated by rapid work to redness. Exact methods of modern metallography make it possible to furnish the most precise and individual requirements of steel users in any department of industrial life.

THE Calumet & Hecla copper corporation stock affords an object lesson in capitalization of mining properties. This company originally incorporated for \$2,500,000, with 100,000 shares, and has never increased its capital stock, has paid \$79,850,000 in dividends to the holders of the stock, and last week the stock was held in the New York market at \$500 per share. It is true this is but a single instance, and indeed may be said to be a single one out of a few, where the dividends have exceeded the capitalization. Why new mining propositions, wholly unproven, should be capitalized for many millions of dollars, is not apparent. The extent and net value of the ore bodies must eventually determine the real worth of the property, and all mining men know this to be so. If the object is to impress the possible investor who has little knowledge of mining, it would seem that such would expect a fair rate of interest on the capitalization. On the whole, it would seem that generally there is really little direct relation between capitalization and actual value of property owned by a mining company.

System in Mining.

IN order to economically work a mine, it must be done systematically. The plan should be carefully studied out, and each idea given due consideration. The haphazard method may pay in a rich mine when it would not pay in one of low grade. To work systematically requires much time in preparation and often it involves what at first appears to be a great and unusual expense, but the final result will prove, if the time and money have been spent judiciously, that it has been economy to follow a system.

Shafts should be made perfectly straight whenever possible, whether vertical or inclined. At times, however, it seems necessary to change the angle of inclination of a shaft, which may be done without material detriment to hoisting operations, though always resulting in increased expense of running ropes and repairs.

Under no circumstances should a shaft be permitted to depart from its alignment—to swerve to one side, as it were, and yet it is no uncommon thing to find this condition in shafts that are otherwise well appointed.

When a level is run, whether directly on the vein from the shaft or from a crosscut, raises should be driven to the level above as soon as possible. This will improve ventilation throughout the level and also affords a good idea of the value of the ore lying in the block of ground through which it passes. When stopes are large and the square set system of timbering is in use, the raise may be either driven directly up on dip of the vein, or it may be sent up at an angle of 35° or thereabouts along the strike of the vein, and this is the best practice. Through a raise of this character all the timber used in the timber system may be sent down from the level above. Signals are arranged to warn workmen, and the timber is shot down, suffering no damage thereby. In some mines these inclined chutes are lined with plank, that no obstruction may be offered to the passage of the timbers. As stoping progresses upward the timber is still delivered at the topmost floor throughout the entire height of the stope, and all hoisting of timbers by hand, or by snatchblocks from the level below—a slow, laborious and necessarily expensive operation—is dispensed with.

Whenever possible, all waste rock resulting from exploration should be employed as filling in mines where filling is necessary. Winzes can be sunk more cheaply with portable hoists, run by either air or electricity, than by hand, and where the levels are a long distance apart—150 to 200 feet—it is economy to hasten the connection between two levels by driving both winze and raise contemporaneously.

Where the main shafts are sunk outside of the vein in country rock provision should be made, if there is much of this work to be done, as 500 feet or more, for dumping chutes at the stations above those levels requiring filling. This requires several hundred dollars outlay in each case, but will abundantly pay, as the waste rock from the bottom of the shaft is hoisted a much shorter distance and is dumped into the bin prepared to receive it. This is withdrawn into a car and trammed to a winze connecting with a stope below the level and dumped into the fill. The rock obtained in this manner from 500 feet of an ordinary three-compartment shaft will fill the space left by the extraction of about 3000 tons of ore from the stope. If the expense of providing means for handling the waste underground does not exceed \$200 it is cheap filling, for it must be remembered that this waste, if not utilized in the manner suggested, must be hoisted possibly several hundred feet more, dumped and trammed on the surface, where it is dumped for no useful purpose, generally. This system has been introduced in the Gwin mine, in Calaveras county, Cal., and is said to work satisfactorily. The Gwin shaft is vertical. It would be more expensive to adapt this system to an inclined shaft, but mechanically it can be accomplished. Its advisability remains for the manager to determine in each case.

Underground haulage is receiving increasing attention, and it is becoming generally acknowledged that the system of tramping with men is not entitled to be called a system at all.

Another feature of underground work which

should receive careful consideration is the tracks. It makes little difference what sort of means is employed for moving cars—men, mules or mechanical power—the tracks must be well laid and kept in good condition as far as possible, and particular attention should be given to turnouts. More time is lost at poorly constructed turnouts in replacing derailed cars than would quickly provide a good turnout.

A volume might be written on mine management—not altogether the office management, but the underground management, though the two are necessarily closely connected. A carefully considered system, wherever adopted, has been found not only to give satisfaction, but to be good business because it pays.

Patented Metallurgical Processes.

THE United States patent affords sufficient protection to a bona fide inventor, whether of a new metallurgical process, or some novel household utensil, and there need be little apprehension of infringement upon these rights without redress. The process inventor who declares he has solved the secret of abstracting precious metals from rock containing them at a cost so low as to be practically nil, or to extract gold and silver from rocks where no one else can obtain traces, and who neglects to patent his invention, but declares it to be "secret," is a fakir. During the time an inventor is experimenting on his invention he naturally attracts as little attention as possible, but having solved the problem to his satisfaction he at once proceeds to patent. The discoverer of a new metallurgical process having real merit, whether to treat gold and silver ores, or those of the base metals, is quickly welcomed in the field of metallurgy, but he must be prepared to do all that he claims for his process. There are numerous valuable patented processes in operation in the mining regions which have stood the test of time and which accomplish under proper conditions what is claimed for them.

THE Supreme Court of Montana has rendered a decision in the Pennsylvania case, which has been under consideration for almost a year. The court affirms the decision of the lower court denying a new trial, but refuses to allow plaintiff's cost bill of \$258,000. An important point is that the Supreme Court holds that a trial by jury in mine litigation is within the discretion of the lower court. To this decision Associate-Justice Pigott filed a dissenting opinion. The Pennsylvania case, as it is known, is the outcome of an action brought by the Montana Ore Purchasing Co. against the Boston & Montana Con. Co., to recover damages for ore alleged to have been extracted from three veins claimed by plaintiff to have their apices within the Johnstown and Rarus claims. It was alleged the ore had been removed through the Pennsylvania workings. The question of extralateral right was an important feature of this case and the court decided that extralateral rights govern unless otherwise stipulated in the deed transferring the property. The decision was mostly in favor of plaintiff, though defendant profits by denial of the large cost bill.

WHATEVER the financial conditions of the country, gold is always in demand, and the gold miner finds in panic or war only an increased demand for his product. Silver has dropped slowly and by bounds from \$1.29 per ounce to 48 cents, and the effect upon the silver miner is to urge him to search for gold, and when he searches for gold he usually finds it—often close at home, where he had not previously suspected its existence. As in the past, we all now naturally expect to hear of the discovery of gold in new and unsuspected places, and in all probability we shall not be disappointed.

THE land department at Washington has issued an order dated Dec. 18, 1902, withdrawing temporarily nineteen townships in Shasta county, Cal., from settlement, entry, sale or other disposal. The order expressly states that this temporary withdrawal will not affect bona fide settlement or valid claim made prior to date of the order. The land is largely covered by forest and it is evidently the purpose of the government to take the necessary steps to preserve as far as possible these forests from destruction.

Concentrates.

STOCK in corporations organized under the laws of California is assessable.

NATIVE ANTIMONY occurs in Riverside county, Cal., near the town of Corona.

THE deepest hole drilled in the United States is the oil well of the Forest Oil Co., West Elizabeth, Allegheny county, Pa., 5575 feet.

PYRITE is used almost exclusively in the manufacture of acid in America, as pyrrhotite—the mono-sulphide of iron—is too low grade in sulphur.

AN association of eight persons may jointly take up 160 acres of placer ground, in which event the assessment may all be done at one place.

BECAUSE dynamite sticks will sometimes burn without exploding, should not lead to the belief that this practice may be indulged with impunity.

PURE lead carbonate is a white mineral unaltered at 100° but converted to protoxide at a temperature approaching redness, carbon dioxide escaping.

ON heating crystallized ferrous sulphate, it loses first its water of crystallization, then sulphurous and sulphuric anhydrides, and ferric oxide remains.

"RAWHIDING," as applied to handling ores in British Columbia, means transportation on animals in rawhide sacks from the mines to smelters or railroad point.

THE "cry" of tin is the name given to the peculiar squeaking sound made by a bar of tin when bent or bitten by the teeth. It is a characteristic of tin which is not known to be possessed by any other metal.

THE manufacture of artificial corundum consists, in a general way, of the conversion of the mineral bauxite (a hydrous aluminum oxide) into corundum by means of intense heat and great pressure in an electrical furnace.

AT the Kohlwald colliery, in the Saar district, Germany, in a crosscut where the ground was bad, and exerted great pressure, the workings were lined with concrete for a distance of 20 meters, and it has proven a success.

NO SULPHURIC ACID is imported to the Pacific coast owing to high freight rates from the East. There are nine different acid manufacturing works on the Pacific coast, and acid is cheaper than in the East, where manufacturers have a working arrangement.

ORE BINS at stations of shafts having a low angle of dip may be provided by cutting out for them in the hanging wall side of the shaft. When the shaft is very flat it may require considerable excavation for the bin and approaches, but if there is much rock to be handled on the level it will well repay the cost.

MOST of the ores containing nickel also contain cobalt. Nickelliferous pyrrhotite, which is the most abundant and widespread nickel ore, contains from one-twentieth to one-thirtieth as much cobalt as nickel. Millerite is a brass yellow or bronze yellow nickel sulphide, often associated in small amount with pyrrhotite.

IN ordinary coal gas are contained various heavy hydrocarbons, mainly ethylene, but also propylene, acetylene, butylene, various members of the paraffine series, etc., hydrogen and carbon monoxide, also smaller amounts of carbon dioxide, oxygen, nitrogen, hydrogen, sulphide, carbon disulphide and allied bodies.

WHERE a vein having a gouge accompanying it, in hard rock, dips out of a shaft being sunk on it, but which does not depart a great distance from the line of the shaft, it will usually be found to be economy to remove all the rock between the vein and the shaft, as the speed made in sinking will more than pay for increased expense of timbering and removing ground.

THE introduction of crude petroleum as fuel in a reverberatory furnace at the Sutter Creek, Cal., reduction works has been found to be advantageous, as it permits a largely increased capacity of furnace, and the flame is so completely under control that a more thorough roasting is accomplished than when wood was used. The tallings are also of lower grade than formerly.

THE richest mines of the Leadville, Colo., district were those on Fryer hill. Noted among them were the Robert E. Lee, Little Pittsburg, Chrysolite and Matchless. The ore was discovered within 30 feet of the surface in the Little Pittsburg, lying beneath gravel of the glacial lake bed which covered that region. None of the ore deposits worked in early days on Fryer hill were deep.

CARBORUNDUM, the new abrasive manufactured at Niagara Falls, N. Y., is composed of carbon and silicon, containing 32% of the former and 68% of the latter. It comes from the electric furnace in the form of splendent crystals and great hardness. It is crushed in rolls into grains of various sizes, washed in a solution of acid and water to remove soluble material, dried and sifted to uniform sizes.

ABRASIVE MATERIALS are divided into three classes—those which occur in rock formations and are cut or manufactured into the form desired, still retaining their original structure, as grindstones, whetstones, etc.; those which occur as constituents of rocks or veins, and have to be mechanically separated from their gangue, as garnet, corundum and emery; artificial abrasives, as carborundum, crushed steel and artificial corundum.

CELESTITE and strontianite are the two principal strontian minerals. Celestite is strontium sulphate and

strontianite is a carbonate of strontium. The characteristic test of the strontium minerals is the deep crimson color given the blowpipe flame. The mineral is chiefly used in making fireworks, strontium nitrate and carbonate being used for this purpose. The oxide and hydroxide are largely employed in the manufacture of beet sugar.

IN the rules regulating the storing and handling of nitro powders and exploding caps at the subway now being built in New York City it is not permitted to keep caps and powder in the same magazine; thawing of powder by bringing it into contact with hot water itself is prohibited; the thawing of powder by steam heat at unknown temperature is not allowed, nor is it allowable to prepare powder, fuse and caps in any building or magazine where powder is stored.

TO ETCH on metals, take 1 ounce of nitric acid and 1 ounce of muriatic acid. Mix, shake well together, and it is ready for use. Cover the place you wish to mark with melted beeswax; when cold, write your inscription plainly in the wax clear to the metal with a sharp instrument; then apply the mixed acids with a feather, carefully filling each letter. Let it remain from one to ten minutes, according to appearance desired; then throw on water, which stops the process and removes the wax.

LITHIUM is chiefly derived from two minerals, lepidolite and spodumene. Lepidolite occurs in California near Pala Mission and at Mesa Grande, San Diego county, and the former is the principal source of lithia in the United States. At both localities mentioned tourmalines of various colors are found. The most noted locality for spodumene is the Etta mine, Pennington county, S. D., where it occurs in six-sided crystals of great size—from 12 inches to 3 feet in diameter and 20 feet or more in length.

TO SECURE uniform temper in working parts of machine drills, the various pieces, nuts, bolts and moving parts of the drill are carefully packed in boneash in a steel box, a cover luted on and the whole placed in a furnace, where it is heated to a bright red. The box is then removed from the furnace, the cover taken off and the several pieces of steel thrown into a tank of cold water as quickly as they can be removed from the boneash. This gives the entire lot the same temper, securing the much desired hardness and uniformity of texture.

THE distinction between a fissure vein and a true fissure vein is not apparent. If a vein occupies the plane of a fissure, whether it have a banded structure or not, it is a fissure. Often the parallelism of bands of quartz and slaty or other soft material, called ribbon structure, is produced by the movement of the vein after the vein was formed. Where there has been much movement in country rock adjacent to a vein, the quartz is sometimes found to have been broken into fragments and recemented by the ground-up material of the vein walls, forming a solid, compact mass.

THE drying of ores by calcining previous to dry crushing sometimes does more harm than good when it is intended to treat them by the cyanide process. Particularly is this the case where the ore contains much sulphide mineral, as the partial oxidation of the sulphides interferes with the operation of the process. Such ores should be dried by being subjected to a long-continued low heat, or be treated to a dead roast, wherein all sulphur is eliminated. This is impossible to accomplish by the continuous kiln process, which requires the ore to be roasted in large lumps, in which condition the heat is insufficient to thoroughly roast the ore.

FINELY pulverized quartz is used as a wood finisher. It is ground, floated, precipitated, dried and bolted, and mixed with the proper proportions of japans, oils, etc., to make a paste. This is reduced with turpentine or benzine, so it will flow freely with a brush, and painted on the smooth surface of wood. It is left until it becomes "set up," which takes from a few minutes to half an hour, and then wiped off the surface, leaving the pores of wood filled with minute particles of quartz which have been carried in by the oil. Wood treated in this manner will take a high polish. Quartz employed for this purpose must be pure and white.

THE death of a miner in the J. I. C. mine in Wasatch county, Utah, by the falling of a crosshead upon him while descending the shaft was probably due to the fact that the crosshead was too short. The height of the crosshead should be at least two times its width, otherwise it may assume a slightly diagonal position while in motion, and on meeting the slightest obstruction or inequality in the guides "hang-up" in the shaft, as in the case above mentioned. The bucket continuing to descend, loosens the crosshead by reason of vibration of the cable, and it falls knocking out the clip and severely injuring or possibly killing any one riding on the bucket.

THE so-called "Mother Lode of California" extends from El Dorado county on the north to Mariposa county on the south, a distance approximating 120 miles. The formations encountered within this distance are chiefly black clay slate and amphibolite schist, though serpentine, ankerite, gabbro, diabase and diorite are also abundant. Throughout this entire belt the various mines have only a general similarity, no two being alike. In Mariposa and Tuolumne and southern Calaveras counties the veins are mostly found associated with black slate serpentine, ankerite and amphibolite schist. In central Calaveras county at and near Angels the veins are wholly in amphibolite schist. In northern Calaveras county, the Gwin mine is in black slate. The deep

mines near Jackson, Sutter Creek and Amador City are found in slates and amphibolite schist, and in northern Amador and southern El Dorado, slate predominates. About Placerville the veins of the lode resemble those of the central part of Tuolumne county.

THE fact that iron sulphide (pyrite) occurs in a rock is not good evidence that the rock containing it is not of volcanic or igneous origin. The argument that it would be impossible for pyrite to exist in a rock in a molten state is without weight. Pyrite is not considered an essential constituent of any igneous rock, but both iron and sulphur exist in any eruptive or volcanic rock when in a state of fusion, though of course not in combination as sulphide. Pyrite forms after cooling and is present in almost all intrusive rocks and some volcanic rocks. This pyrite rarely contains more than a trace of gold or silver, and often even traces are not obtainable by ordinary methods.

THE British Columbia law governing the relocation of quartz claims is as follows: The relocation of forfeited or abandoned quartz or lode claims shall only be made by sinking a new discovery shaft and fixing new boundaries in the same manner and to the same extent as is required in making a new location, or the relocater may sink the original discovery shaft 10 feet deeper than it was at the date of the commencement of such relocation, and shall erect new or make the old monuments the same as originally required. In either case a new location monument shall be erected and the location certificate shall state if the whole or any part of the new location is located as abandoned property.

CORUNDUM is divided into three classes: 1. Sapphire, which includes all corundums of whatever color that are transparent to semi-transparent. 2. Corundum, including the translucent to opaque varieties of all colors. 3. Emery, which is a mechanical admixture of corundum and magnetite or hematite. Corundum occurs in rocks of many kinds. The following occurrences of corundum are known in the United States: In peridotite; in biotite contact on saxonite; in eustatite; in serpentine; in chlorite; in amphibolite; in norite; in basic minette; in andesite; in amphibole-schist; in syenite, and in quartz schist. The greater number of localities are in the Eastern States, extending from New England and New York to Georgia. Corundum occurs in syenite in Gallatin county, Mont., 25 miles south of Belgrade. It also occurs in Plumas county, Cal.

THERE are two minerals mined and sold under the name of asbestos. One is a variety of amphibole, a silicate of calcium and magnesium; the other a variety of serpentine, known as crysotile, a hydrous silicate of magnesium. The latter is superior in the strength and elasticity of fiber, though each has about equal resistance to heat. Crysothile is usually greenish white to greenish yellow in color, of silky luster and composed of fibers easily separable. They seldom exceed 2½ inches in length. The fibers of the amphibole variety are sometimes 3 feet in length. They lack the silky luster of the crysotile, rather resembling flax in appearance. The fibers of the amphibole variety lie parallel with the schistose structure of the rock in which it occurs, and crysotile, occurring in small veins, lies at right angles to the strike of the vein. The only known deposits of merchantable crysotile are in Canada, Vermont, Wyoming and California.

THERE are two varieties of mica having a commercial importance—muscovite and phlogopite. The former is that most commonly seen, and is a constituent of many crystalline and sedimentary rocks. Its principal value is due to its occurrence in blocks or masses (called books) capable of being split into sheets a square inch or more in size, the value of which increases with increasing size. Although mica is a common rock constituent, the commercial deposits occur for most part in pegmatite dikes, sometimes called coarse granite. All of the minerals occurring in dikes of this character are of exceptionally coarse crystallization. Where the minerals of the dike occur in small masses the mica is also usually in small plates. A new use has been found for smaller sheets of mica which are cut into circular discs, from ¼ of an inch to 2 inches diameter, for use in electrical work as insulators. Small pieces of fine clear mica cut from large sheets are split very thin, rearranged and cemented together under heavy pressure, forming large sheets, which are then cut into desired shapes and sizes.

PYRITE and MARCASITE, iron sulphides, are usually distinguished by their differences of crystalline form, color, density and ease of oxidation. Pyrite usually crystallizes in cubic form, though often in complicated forms of the orthorhombic system. Sometimes the mineral assumes a massive or compact form without crystalline structure. Pseudomorphs are not uncommon. In color pyrite is described as brass yellow, while marcasite is tin white, grayish white, greenish brass yellow or bronze yellow. True colors can only be safely judged in fresh untarnished specimens. Tarnished specimens of marcasite when washed with warm dilute hydrochloric acid show a tin white or grayish white color, with no trace of yellow. To distinguish between pyrite and marcasite by color alone they must be washed with dilute hydrochloric acid and examined at once by good strong white light. Marcasite oxidizes more rapidly than pyrite under the same conditions, but a compact well crystallized specimen of marcasite can be kept a long time without other change than a slight tarnish; whereas finely divided or porous pyrite oxidizes with great rapidity, which fact has frequently caused pyrite to be mistaken for marcasite.

Use of Lime as an Alkaline Reagent in Cyaniding.

Written for the MINING AND SCIENTIFIC PRESS by
ERNEST GAYFORD.

In September, 1893, the writer, who was at that time on the technical staff of the Gold & Silver Extraction Co. of America, owners of the MacArthur-Forrest patents, was sent to Salt Lake City, Utah, as assistant to William Orr, F. I. C., the well-known metallurgist and chemist, who then represented that company in Utah, Idaho, Montana and Nevada.

The old Mercur G. M. & M. Co. were then lessees of the Gold & Silver Extraction Co., and their mill at Manning, Utah, was the largest under Mr. Orr's technical supervision.

The consumption of cyanide at this mill had risen to a somewhat alarming extent above the normal, and I was sent by Mr. Orr to Manning to ascertain the cause of this abnormal consumption and, if possible, overcome it.

After familiarizing myself with the ore, the plant, and the methods employed, I conducted the following tests:

No. 1—100 grams of the crushed ore were digested with 100 c.c. of a .1% KCy solution, without the addition of lime; KCy consumption = 1.5 pound per ton of ore. To another 100 grams of ore .25% lime was well mixed and mixture treated with same solution: KCy consumption = 0.6 pound per ton of ore.

No. 2—100 grams ore digested with .5% KCy solution to determine how much cyanide would be destroyed in the presence of an excess of cyanide (the working solution at the mill was kept at a standard of .075%); consumption = 2.2 pounds per ton. Cause of consumption determined quantitatively in the solution was found to be principally due to arsenious and arsenic acid compounds and aluminum salts.

No. 3— $\frac{1}{2}$ pound ore leached for twelve hours with .15% KCy solution, no lime, consumption = 1.4 pound; $\frac{1}{2}$ pound ore leached for twelve hours with .15% KCy solution, .1% lime, consumption = 0.9 pound; $\frac{1}{2}$ pound ore leached for twelve hours with .15% KCy solution, .25% lime, consumption = 0.4 pound; $\frac{1}{2}$ pound ore leached for twelve hours with .15% KCy solution, .5% lime, consumption = 0.3 pound.

No. 4—Free acid in the ore was found to be .0123%; latent acid in the ore was found to be .0157.

No. 5—1 pound ore agitated with 1 pound distilled water, digested for one hour, then filtered. To 100 c.c. of this filtrate was added 100 c.c. of a .5% KCy solution, allowed to stand, then titrated to determine loss due to soluble acids. Result showed no loss.

No. 6—A sample of the tailings as they were discharged from the tanks was taken to determine the amount of cyanide "held up" in them = 0.3 pound per ton. The following method was used for this: The percentage of moisture in the tailings was determined—say they were found to contain 20%; then weigh out 120 grams of tailings, place in a beaker, add 80 c.c. water, shake for a few minutes, filter, then titrate filtrate as in ordinary mill solutions; as the proportion of ore to solution (water) is 1—1, then whatever amount of cyanide was found in the solution indicated the loss per ton of ore—i. e., cyanide mechanically held up in the ore.

No. 7—No soluble sulphides were found in the mill solutions.

After reporting the results of my tests to Mr. Orr we decided that the results all pointed to the fact that the consumption was almost entirely due to basic acid salts, which could be partially neutralized by a judicious use of lime, which should have no detrimental effect on the per cent of gold extracted.

Upon investigating I found that on previous occasions lime had been added to the ore before it was put in the tanks, but no benefit was noticed from its use. Investigating further, I found that the method adopted in adding the lime was as follows: A certain amount—about 2 pounds to the ton of ore—of unslacked lime was thrown on the top of the pulp car previous to dumping it into the tank. Now, as the Mercur in those days was treating only oxidized ore and crushing very coarsely (to 1-inch mesh) it was very evident that in this method of adding the lime it was impossible for it to become thoroughly mixed with the ore, and therefore its use had never been given a fair trial.

We decided to dry slack our lime, screen it through a 6-mesh screen, and add it in small quantities at a stated rate per hour into the Gates crusher, with the ore, in this way giving it a chance to get mixed up in the revolving screen.

The daily capacity of the mill was about 300 tons and 400 pounds of cyanide were being used per day. We commenced by using 15 pounds of lime per running hour of the mill, and testing the solution frequently to catch any increase in its strength, while still using the same quantity of cyanide as had previously been added before using lime.

The lime was added a little at a time and considerable care taken to get it thoroughly mixed with the ore. During the day the writer added the lime into the crusher himself, leaving a weighed quantity to

be used by the night shift. At this time the strength of the solution used in the mill was kept as nearly as possible at 1.5 pound per ton. This was done by the addition of a certain quantity of fresh cyanide every hour to the "tail" of the zinc boxes, Mr. Orr having found by previous experiments that solutions of this strength gave the best average extraction, so that the point to be gained was to ascertain how little cyanide could be used and still keep the solution up to its working strength.

The solution was carefully and frequently sampled on the two days preceding the use of lime, and its strength was found to be 1.7 pound and 1.8 pound KCy per ton, using 400 pounds of cyanide per day.

On September 18th 250 pounds of lime were used to 316 tons of ore, and on the 19th 336 pounds of lime were used to 290 tons of ore. On this day it will be seen by the table below that the strength of the solution had risen to 2.06 pounds per ton, and the quantity of cyanide per day was reduced by 50 pounds.

The strength of the solution still kept increasing and on the 21st another 50 pounds was knocked off; on the 22d 12 $\frac{1}{2}$ pounds, and on the 23d 12 $\frac{1}{2}$ pounds more, and the lime was increased.

From the table it will be seen that between September 20th and October 13th the amount of cyanide being used per day had been reduced by 196 pounds, and 4 pounds of lime per ton of ore were being used.

At this point we found we had gone as far as was feasible, as any further increase in lime did not increase the strength of the solution sufficiently to compensate for the consumption of cyanide that took place in the zinc boxes due to an excess of alkali in the solution.

DETAIL OF THE USE OF LIME AT MERCUR MILL, MANNING, SEPTEMBER, 1893.

Date.....	Pounds of Lime.....	Tons of Ore.....	Pounds of KCy.....	Strength of Solution.....	No. Samples of Solution Taken.....
Sept. 16.....	...	321	400	1.7	7
" 17.....	...	314	400	1.8	7
" 18.....	250	316	400	1.5	5
" 19.....	336	290	400	2.06	10
" 20.....	360	306	350	2.5	10
" 21.....	288	290	300	2.3	10
" 22.....	260	220	287.5	2.15	12
" 23.....	480	371	275	1.98	12
" 24.....	340	239	275	1.92	10
" 25.....	495	305	275	1.9	13
" 26.....	600	332	250	1.9	11
" 27.....	525	292	250	1.8	12
" 28.....	660	299	250	1.88	8
" 29.....	630	297	240	1.93	9
" 30.....	630	818	228	1.8	9
Oct. 1.....	745	303	228	1.68	9
" 2.....	805	321	228	1.84	10
" 3.....	800	301	216	1.73	10
" 4.....	840	304	216	1.67	9
" 5.....	920	322	216	1.66	9
" 6.....	865	302	216	1.75	10
" 7.....	953	327	216	1.65	12
" 8.....	945	319	216	1.65	8
" 9.....	945	336	206.5	1.62	16
" 10.....	1025	297	204	1.6	9
" 11.....	1050	326	204	1.6	9
" 12.....	1050	302	204	1.6	8
" 13.....	1100	295	204	1.59	8

Notes on Assaying.

TO THE EDITOR:—The use of borax, fully hydrated, or even partially so, in the body of the charge, for fluxing purposes in assaying, cannot be too strongly condemned. Its use, however, as a cover for the charge is to be recommended. For this purpose the crude article, or borax of a high degree of hydration, is superior to the anhydrous borax or borax-glass. Used in this manner it swells and curls above the charge at a very low temperature, forming an impervious cover or roof through which spouting can not occur; and as the melt progresses the then fused borax sinks into the charge ready to perform its function as a flux.

In regard to the use of hydrated sodium bicarbonate, this must be regulated by the individual requirements of different ores. But aside from a consideration of the chemical reactions merely, between the ore and fluxes during fusion, it is necessary to have a certain looseness and tumbling about of the charge to obtain a proper contact and settling of the lead containing the precious metals. If anhydrous fluxes alone are used there is but little boiling, the charge is pasty and the reduced lead sinks through it only after prolonged heating at a very high temperature.

The evil resulting from "dusting," which is caused by the production of a large volume of gas or vapor, is entirely obviated by the use of a crude-borax cover, as above noted, but as this condition is more often due to the presence of carbon or sulphur than to hydrogen, the argument against hydrated fluxes, because of dusting, is without effect.

Prescott, Arizona, Dec. 20. A. D. BARNHART.

Experiences of a Working Miner.

Written for the MINING AND SCIENTIFIC PRESS.

Mining requires enterprise, energy and courage, and incidentally money—one's own or other people's. There are many who have all of the former qualities when backed by the latter. P— of S— B— had all of the former in abundance, but was woefully deficient financially. This, however, did not daunt him in the least. He happened to know of a gold mine on the Mojave desert, in California, and knew that this mine contained considerable value, but not enough to pay expenses. The property was worked through tunnels, and was equipped with a mill. This was fortunate, for he would have been unable to have provided a mill. P— hired a four-horse team and wagon, loaded it with tools, supplies, provision and men—all on credit, herein showing his courage—and proceeded to the lonely desert mine, which, by the way, he did not own, had not leased nor bargained for—evidencing his enterprise—and upon arrival at his destination set the men to work making preparations to start up. This was soon accomplished. Wood and water were hauled, ore broken in the mine and the bins in the mill were soon filled. This showed his energy. The stamps were dropping inside of a week and for three weeks things ran smoothly, a goodly amount of amalgam being collected. This having been successfully accomplished, P— took the cleanup and vanished into the desert distance, proving his possession of another quality not previously mentioned—discretion—for the sheriff had been in some manner made acquainted with P—'s enterprise, and went out across the desert to interview him, but P— reached the railroad first by forty-eight hours and has not been heard from since. This was the first and only time that the H— mine on Dry Lake had ever been known to pay a dividend.

**

The M— mine at L— was a new enterprise. A vertical shaft had been sunk 400 feet and a new hoisting engine put in. The machinery was all in place and everything was ready to run. Four men were at work in the bottom of the shaft. A skip was sent down and was filled with rock at the bottom. A single bell gave the signal to hoist. The engineer carefully and slowly started the load, brought it up into the head frame and dumped it. Here he should have made side marks on his reel, to show exactly the point where the engine should be stopped, but this precaution was neglected. The skip was lowered for a second load and in a few minutes again came the single bell—to hoist. Once more the engineer cautiously pulled the throttle and the load was hoisted and dumped without incident. A third time the skip was sent down into the deep, black shaft for its cargo of rock. Once more the signal bell. The superintendent stepped to the levers and with firm and confident hand started the skip from the bottom. All went well, and the load in time came to the collar of the shaft. The "super" still grasped the throttle and brake levers, and with keen eye fixed on the indicator, about 12 feet distant, continued to hoist. The skip wheels ran forward onto the horizontal track and the lower end slowly lifted and overturned. At this point had the "super" shut off steam all would have been well, but he thought the index did not quite cover the mark on the indicator and hoisted a little farther. He overwound about 18 inches and with a crash and roar nearly half the skip load of rock fell into the shaft—and four helpless miners below, in blissful ignorance of what was happening on the surface, with no sheltering drift to dart into.

The "super" looked white and we all held our breath—consternation on every face. An auxiliary engine was still in place at one side, and the foreman was slowly lowered into the shaft. He had good nerve and was prepared for a terrible sight at the bottom of the shaft. He reached the bottom and after several minutes came the signal 3—1 (hoist men). Ever so slowly the bucket was hoisted with the entire grimy, mud-bespattered crew. But the pallor of their faces could be plainly seen through the dirt. Not a man injured—a miracle. Only a small quantity of the rock reached the bottom of the shaft, the greater portion falling upon the timbers. "All's well that ends well," and the entire incident illustrates clearly the necessity for employing common sense about a mine, particularly where the lives of men is a consideration. No one should attempt to run automatically dumping rock carriers without side marks on the hoisting reel. The indicator is useful only to give general knowledge of the position of the skip in the shaft, and should not be depended upon for exact placing of the skip at levels or elsewhere in the shaft or at the surface.

THE fact that an ore deposit does not go down should not condemn it, if the deposit is large enough and rich enough to pay a good profit as long as it lasts. It has the advantage, at least, of indicating to the miner when to stop expenses in a useless search for more ore.

The Mining Industry of the Cœur d'Alenes, Idaho.*

By J. R. FINLAY, Colorado Springs, Colo.

GENERAL DESCRIPTION.—Of the Cœur d'Alene silver-lead mining district of northern Idaho, so far as the writer is aware, little has been written, and little is known about its geology and resources. People interested in lead-smelting are, of course, cognizant of the economic importance of the region, but they have not communicated much of their knowledge to the public.

Exact figures as to the total output of the district

1901 the product was about 150,000 tons of concentrates, with a gross value of \$8,250,000.

The central point of the district is the town of Wallace. The main feature of the topography is the low range locally termed the Cœur d'Alene mountains, which are the northern extremity of the Bitter Root range. The highest summits in the neighborhood of the mines scarcely exceed 6000 feet in altitude. The mountains are the remnants of a deeply eroded broad plateau. The veins have been found outcropping at altitudes varying from 2400 feet at the extreme west to 6000 feet at the eastern and northern extremities. The country was once covered with a dense forest of fir, pine, cedar and tamarack. Near the mines a good deal of the original forest has been destroyed by fire or axe; but everywhere a new

dike on the ridge between Canyon and Nine Mile creeks. This mass has produced a well-marked contact metamorphism in the slates and greywackes which surround it, and has exercised an important influence on the vein formation of its neighborhood. The important mines on Canyon creek are all within a mile of it; and silver-lead veins of more or less value occur at intervals along its whole periphery and even within its borders.

At a number of places there are basic dikes, usually narrow, producing little or no metamorphism in the sedimentary rocks, dark green in color, heavy and unaltered. In some cases they cut through the lead-bearing fissures, with no effect whatever on the values or the mineralization of the veins. But in one important instance the Hecla vein follows a narrow

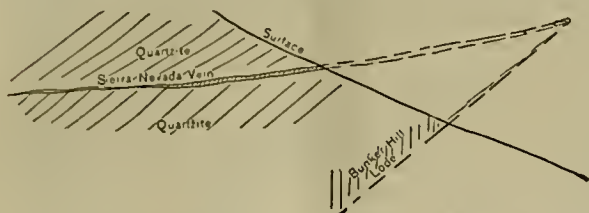


Fig. 1—Sketch Showing Relation of Sierra Nevada and Bunker Hill Lodes.

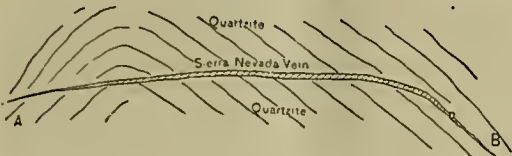


Fig. 2—Plan Showing Course of Sierra Nevada Vein.

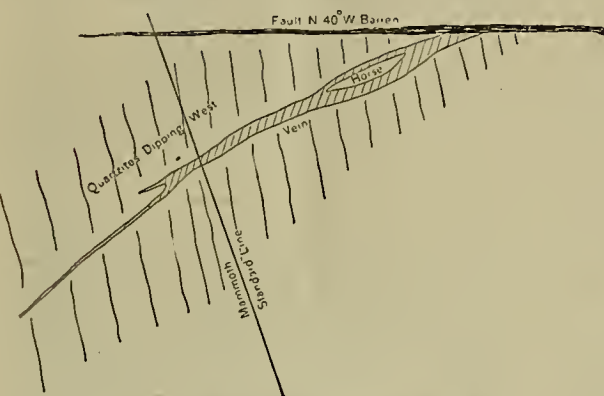


Fig. 4—Mammoth-Standard Vein Showing Fault.

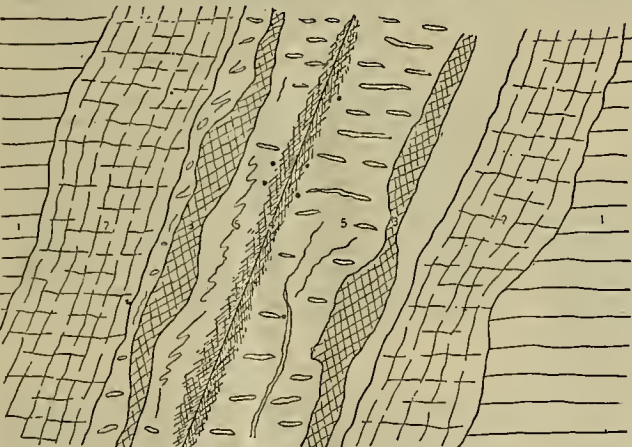


Fig. 6—Structure Mammoth-Standard Vein.

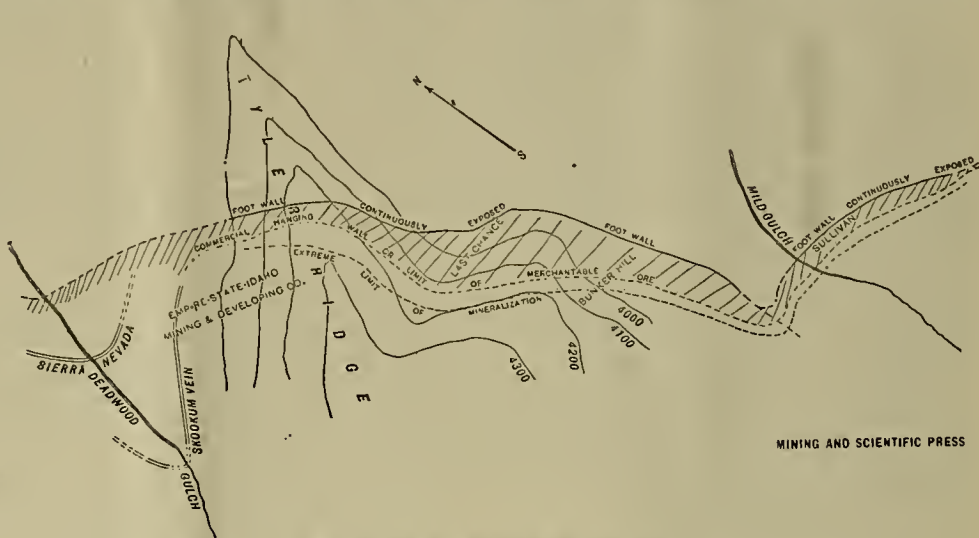


Fig. 3—Showing Outcrop Bunker Hill Vein.



Fig. 5—Workings Sierra Nevada Mine.

are not obtainable, but the following estimates, covering the entire output of the fifteen years during which the mines have been operated, are believed to be approximately correct:

Group of Mines.	Product.
Wardner Group, including the Bunker Hill and Sullivan, Empire State-Idaho, Last Chance, Sierra Nevada, Cœur d'Alene Development Co.....	\$17,500,000
Canyon Creek Group, including the Gem, Frisco Consolidated, Granite, Standard, Hecla, Tiger-Poorman, Custer and Bell...	35,000,000
Mullan Group, including the Morning, You Like and Gold Hunter.....	7,500,000
	\$60,000,000

This output covers the period of discovery and early struggles, and several periods of stagnation caused by strikes and other serious labor troubles. In 1900 the output of the district was fully \$10,000,000, and this figure would have been considerably increased in 1901, had not a curtailment of production been forced by the condition of the lead market. In

growth keeps the hills green.

The geology of the Cœur d'Alenes has never been thoroughly studied and practically no details of it can be given. A vast formation of slates, greywackes and quartzites, thrown into east and west folds, covers the entire region. These rocks are all fine grained, no conglomerates or even moderately coarse sandstones being seen anywhere. True vitreous quartzites are rare. The rocks in which the lead-bearing veins occur are usually light colored and could be best described as fine-grained greywacke, or something between slate and quartzite. There is only a mild regional metamorphism. As a rule, very little formation of new minerals has taken place in the rocks. They are generally banded, though the stratification is often obscured by dynamic action. Rarely, however, is there a well-developed cleavage. The movements in the rocks have only produced a strong jointing in a direction usually parallel to the neighboring fissure veins. This jointing is so pronounced in places as to give a schistose character to the rocks.

Igneous intrusions are rare. Only two kinds have been observed. The most important is a syenite or quartzless granite, which makes an enormous boss or

dike for its entire length. The mineralization has taken place along the walls of the dike and in many places the basalt seems to have been, to some extent, actually replaced by galena.

VEINS AND ORE DEPOSITS.—All the ores of the region come from fissure veins, in which argentiferous galena is associated with large quantities of siderite. The fissures occupy fault planes, on which the amount of movement is indeterminate, but probably in some cases considerable. The fissure is usually well marked by a streak of gouge, between walls which are slickensided and often beautifully polished. As a rule only one principal plane of fissuring can be found in each vein. This is very apt to occur near the middle of the vein, but often forms one wall of the lode. Two defined walls, marked by planes of movement, are extremely uncommon.

The principal minerals of the lead-bearing lodes are quartz, siderite, galena, zincblende and pyrite. Near the surface oxidation has produced lead carbonates, iron oxides, manganese oxides and native silver.

The minerals in some veins are scattered somewhat indiscriminately through the mineralized zone;

*Trans. Am. Inst. Min. Eng.

but they are more apt to be arranged in streaks or zones parallel to the master fissure. It is noticeable that, along the actual fissure plane, the galena and other minerals are nearly always fine grained, while at some distance from it they are apt to be much coarser.

In some veins the minerals are found to be well segregated in individual streaks, the argentiferous galena, for instance, forming seams containing from 60% to 80% of lead. In other veins, or even in other parts of the same vein, the various minerals are intimately mixed in the same ore streak, greatly diminishing its value. In different mines, and even in the same mine, the proportion of silver in the galena varies greatly, say, from 0.25 ounce to 2 ounces of silver to 1% of lead.

The ore bodies occur in every conceivable position, from horizontal to vertical. Some of them are large, containing millions of tons of concentrating ore. Three of the most valuable deposits in the district do not reach the surface at all, their apexes lying several hundred feet below it. Two of these are and the third is not below the limits of oxidation. It does not appear that leaching by surface waters has in many cases destroyed the lead values, but there are instances where this has happened. The workable deposits, as mined, carry from 5% to 25% of lead. The average values for the district are perhaps 10% lead and seven ounces silver per ton.

THE BUNKER HILL LODE.—This fissure differs notably from the other veins of the Cœur d'Alenes. It seems to be the sole source of the ore in the Wardner district. For 6000 feet from the eastern end of the workings of the Bunker Hill and Sullivan to the Viola claim of the Empire State-Idaho, the workings are continuous. From the Viola northwestward to the Crown Point the continuity of the fissure is not so clearly established; but all the ore that has been found follows the same extended line, and the workings on the Silver King and Crown Point display a fissure with the same dip, strike and general characteristics as in the Bunker Hill.

All the mineralization has taken place on the hanging wall side of the fissure, which therefore forms the foot wall of the lode. A white "gouge" of thoroughly crushed and altered rock lies upon the unchanged quartzite of the foot wall. Lying upon this white gouge is a strongly mineralized zone, which begins with a streak of bluish or black gouge containing galena, always very fine grained. The lamination of the rocks parallel to the fissure plane is strongly marked for only a moderate distance (from 5 to 50 feet) from it; but within this zone of parallel lamination the minerals, valuable or otherwise, are invariably fine grained. The lamination in this foot wall zone has reduced the rock to the condition of gouge material only for a foot or two next the foot wall.

Passing outward from the fissure, the mineralization extends far into the hanging wall, which has undergone much fracturing. For from 100 to 300 feet from the fissure the joints and seams in the quartzite are apt to be filled with galena, with subsidiary quartz and iron carbonate. Farther from the foot wall the quartz, siderite and pyrite predominate, to the final exclusion of the galena.

The quartz, siderite and pyrite in their turn diminish in amount until at, usually, not more than 400 feet from the foot wall, all mineralization has disappeared, and the quartzite of the hanging wall resumes the appearance of the foot wall quartzite.

The workable ore bodies in the Bunker Hill lode are simply those portions which contain enough galena to pay for working. Ordinarily such bodies lie partly in the laminated zone next to the foot wall or fissure, and partly in the fractured rock in immediate contact with this zone, on the hanging wall. In almost every case ore bodies appearing in some places to be at a considerable distance from the foot wall have been found, when followed up, to connect with it. There are, however, three conspicuous ore bodies, the "workable" connection of which with the foot wall has never been established. Two of these (the Curtis-Hatton body in the Bunker Hill and the hanging wall stopes in the Last Chance claim) seem to follow channels made in some way by the fracturing of the hanging wall in a course essentially parallel to the foot wall, but at some distance from it; and the third, the Sierra Nevada deposit, is a unique occurrence, which merits a more extended description.

As a general fact, however, it may be declared that the main foot wall fissure was the source of all the mineral deposition along the lode; that the ore-bearing solutions have enriched portions of the hanging wall country wherever a favorable channel existed, and that these channels may have been cross fractures or local branch fissures, regions of extensive crevice openings due to jointing, or openings along the bedding planes of the rocks.

THE SIERRA NEVADA LODE.—This is a peculiar and highly specialized example of a branch vein. It is a fissure with the shape of a broad anticline which dips gently southwest, nearly at right angles to the strike of the great fissure. The actual intersection of this anticlinal deposit with the fissure has been destroyed by the erosion of Deadwood gulch, but the deposit obeys in a general way the rule governing the other deposits along the Bunker Hill lode. From a point on the surface on the crest of the anticline

nearest the line of the main fissure it slopes gently away down the crest and sides of the anticline, and, as it does so, it loses its ore, becomes more quartzose and ferruginous until, as in other deposits, nothing remains in it but quartz and iron.

This remarkable deposit, covering an area of six acres, has been worked out. The old mine levels show the contours of the anticline. The ore was all oxidized, rich in silver, and from 6 inches to 6 feet thick.

THE CANYON CREEK LODES.—These are very different from the Bunker Hill. The fissures are much smaller, simpler, and more uniform. They are nearly vertical, rarely dipping less than 75° north or south.

THE MAMMOTH-STANDARD VEIN.—This important lode has produced lead and silver of the gross value of about \$11,000,000, yielding at least \$3,000,000 in dividends. It has been traced from the west end-line of the Mammoth claim eastward to about 900 feet east of the line between the Mammoth and the Standard, at which point it has been cut off by a considerable fault, and the continuation has not yet been found. The lode has proved productive for a length of 2400 feet; and, by a curious coincidence, its richness seems to increase until its abrupt termination by the fault-plane above mentioned. (See Fig. 4.)

The fissure strikes north 65° west and dips 77° north. The quartzites along the fissure dip west at a moderate angle, so that the vein cuts the formation nearly at right angles.

The fissure is a fault of moderate displacement. A well-defined plane of movement can always be found in the vein, sometimes on one side, sometimes on the other, and often in the middle. As in the Bunker Hill lode, the ore immediately next the fissure shows a finer grain than that deposited farther away. Fig. 6 shows the arrangement of the ore bodies on the Standard and Mammoth, as developed on the Campbell tunnel level.

In the Standard mine, the vein has always two, and often three or more, well marked ore streaks; but west of the Standard ore shoot there is seldom or never more than a single streak.

The ore body mined on the Standard varies from 5 feet to 50 feet, and averages about 17 feet in width. There are no defined lode walls, the fissure invariably lying within the mineralized zone, and the mineralization having affected the sheared rocks on either side. As a general rule the rock on each side of the ore body is sheared and crushed for 3 feet or more from the outermost ore streaks to such a degree as to render the ground loose and unstable. Beyond the limit of the sheared zone the country rock is firm and unaltered except where it is affected by transverse faults. The parallel zones of sheared rock on each side of the ore make the walls very heavy and practically impossible to hold by timbering.

THE FRISCO LODE.—This deposit has been disturbed by a number of cross faults. The fissure proper is nowhere well marked, but the whole mass is firmly cemented together and the mineral is "frozen" to the walls.

(TO BE CONTINUED.)

Seeking Increased Water Supply.

The demand for a constant and abundant supply of pure water is continually increasing in large cities and in some of them the problem has become one of paramount importance. This is notably the case with New York City. Twenty years ago the old Croton aqueduct supplied all demands, but the foresight of the city's engineers resulted in the construction of the new Croton aqueduct. Now, it is seen that ere many years this will afford an insufficient supply. The United States Geological Survey has taken up this matter and water supply paper number 76, of the Survey, now in press, consists, in the main, of technical "Observations upon the Flow of Rivers in the Vicinity of New York City," by P. A. Pressey. The measurements of the rivers discussed in this paper were started at the suggestion of G. A. Birdsall, chief engineer bureau of water supply, New York City, in order that data might be available for investigations as to additional water supply for New York City.

In considering the future demands of the city of New York for water, Lake George, Lake Champlain, the Great Lakes, and the Hudson river have been suggested. It has been found that the supply from Lake George would not be adequate; that Lake Champlain is at too low an elevation for economical use; and that the supply from the Great Lakes would entail great and unnecessary expense. The water from the Hudson river might be taken near its headwaters and conducted to New York City by a long aqueduct, or the intake might be located just above Poughkeepsie, which would necessitate pumping and filtering before delivery at the city.

In the summer of 1901 a reconnaissance was made of Catskill river and Esopus creek, Wallkill river and Rondout creek, west of the Hudson, and of Fishkill creek, Ten Mile river, and Housatonic river, east of the Hudson.

Nearly the entire length of each stream was traversed, and a site for a gauging station selected for each. The results of the measurements have been published in water supply paper No. 65.

Motions of Underground Waters.

The amount of water within the crust of the earth, says Prof. C. S. Slichter, in a paper entitled "The Motion of Underground Waters," recently published by the U. S. Geological Survey, "is enormous, amounting to 565,000 million million cubic yards." His estimate is based upon the supposition that the average depth which waters can penetrate beneath the surface is 6 miles below the land and 5 miles below the ocean floor. This vast accumulation, if placed upon the earth, would cover its entire surface to a uniform depth of from 3000 to 3500 feet. Under the influence of gravitation, the water is generally in motion, and the object of Prof. Slichter's paper is to describe the rate and manner of its overflow and the laws governing the same. Experiments have shown that not only do sands and gravels possess porosity, but rocks, presumably solid and compact, may be traversed by water. Even so hard a rock as Montello granite, selected for the sarcophagus of the tomb of General Grant on account of its great strength, shows a porosity of 0.23%. The most productive water-bearing rocks, however, are found to be the porous sandstones, and, in some cases, limestones, whose inner texture has been chemically dissolved.

The popular idea of underground waters is derived from the rivers of copious discharge found in the Mammoth and other caves. But this idea is erroneous, as such streams, though of great local importance, are comparatively rare. The great mass of ground water slowly percolates through sand and gravel deposits, sandstone and other porous material under a wide extent of territory. Though its motion carries it but a fraction of a mile in a year, this ground water is so widespread and often so accessible as to be of the greatest economic importance.

The rate of movement of the underflow has been the subject of long and careful investigation. To determine this interesting question, measurements have been made in the river gravels of streams whose surface flows have ceased, and from such measurements more or less trustworthy results have been obtained. One of the most accurate and interesting of these is a series of experiments conducted by Prof. Slichter along the valley of the Arkansas river in western Kansas. The method is an electrical one. A double row of 1½-inch drive wells is sunk across the channel of the river whose underflow is to be tested. The upstream wells are then charged with a strong electrolyte, which dissolves and passes down the stream with the moving water. The passage of the electrolyte toward the lower well is shown by a sudden and strong deflection of the needle. It is exceedingly interesting to watch the gradual movement of the water, which can be traced from the beginning of the experiment in this indirect way. By this method the rate of flow 10 feet below the bed of the Arkansas river was found to be 2½ feet per day. Other experiments in the beds of the Hondo and San Gabriel rivers, in southern California, gave rates of 3½, 4, 5½ and 7 feet per day.

The knowledge of the underflow that exists beneath the gravel of all river valleys has been taken advantage of in arid sections of the West, where the running dry of streams deprives irrigators of their water supply. By excavating to bedrock in river gravels and building an impervious barrier across the channel, these underground waters are saved in sufficient quantities to be of great value to the farmer. A notable subsurface dam of this kind has been constructed on the Pacoima creek, Cal., to furnish water for irrigation and domestic use.

New Uses for Slag.

The utilization of the slag from furnaces, after long discussion, has passed the experimental, and reached the profitable, practical stage, says Cement and Slate. Its reduction to a granulated substance has opened a wide field for its use in various arts. As a vitreous sand, it is made into bricks by mixing with a suitable cement, and, mingled with lime, it makes a good mortar. The bricks are pressed and sun-dried at a cost 25% less than common bricks, and as they are white, they are quite popular with builders. The sand, scattered on unburned clay bricks, gives them an enameled face when hurned, and, by mixing with fire clay, an exceedingly refractory firebrick is produced. By various other processes, this useful sandy product is made into cement, shingle for road-heds, brick dust for flooring, and for hedding in which to run hot metal in making pig iron. It has been also used for ballasting railroads, and for ships' ballast; but the demand for slag bricks is so good that it is thought these two markets will soon be denied. The most common way of treating the slag is to run it from the furnace into a powerful stream of water that falls into a tank. The velocity of the water carries the sand into the tank, and the water flowing under the molten metal is partly converted into steam that materially aids in shattering and disintegrating it. From the tank, the sand is raised by means of an elevator, and the whole apparatus only demands the attendance of two boys to keep it stirred in the tank, and power to move the elevator.

An Experience in Drift Mining in Hard Cement Gravel.

Written for the MINING AND SCIENTIFIC PRESS by L. H. CARVER.

Believing that the exchange of ideas, opinions, and actual experiences while engaged in the every-day work about a mine, through the medium of a paper like the MINING AND SCIENTIFIC PRESS, presents one of the very best means for the dissemination of useful knowledge, the writer will take advantage of the opportunity thus afforded to describe as briefly as



possible the methods employed by him in superintending the operation of a drift mine in Calaveras county, Cal., with the hope that some benefit may be derived therefrom by those who are engaged in similar operations elsewhere, in which event the satisfaction of knowing that he has in a measure contributed to their success, will amply justify the effort.

The mine in question is located on the old Fort Mountain channel, an ancient channel traversing the county in a general north and south direction, as shown in the accompanying map, and is opened by a

vertical shaft sunk on the edge of a ravine, the depth at this point being 55 feet, where it encountered bedrock on the west rim of the channel.

From the shaft, levels are run up and down the channels, with air shafts at each extremity, the south shaft at the down-stream end of the ground being provided with a pump for handling the water at this end of the mine. (See Fig. 1)

Drifts are run from the main gangways or levels, across the channels at regular intervals in the usual manner, and the gravel breasted out and removed in cars to the shaft, where a bin or pocket has been constructed to expedite hoisting, and enable carmen to deliver gravel and return without delay.

The previous method in vogue here required the use of wheelbarrows in moving gravel from the breasts, boulders being allowed to remain in the drifts, and planks laid over them for a runway to the main gangway, where the material was dumped on platforms and shoveled into cars, a slow and laborious method, often attended by annoying accidents in transporting the material over the narrow and insecure footway. There being no receptacle at the shaft for the storage of gravel, the carmen were compelled to wait for the bucket, and it frequently happened that cars would arrive simultaneously, from both sides, one being compelled to wait for the return of the bucket, after the other had dumped its load and signalled to hoist.

A great deal of time was thus lost that could have been more profitably employed in storing boulders and other work, after the gravel from that particular breast had been removed.

This system was immediately changed and switches and tracks laid in the drifts, being subsequently removed as the breasts were carried forward; the sump was cleaned out and a bin constructed enabling cars to make a round trip without delay, and the water bucket was replaced with a pump, removing another source of vexatious delay, when it was required to hoist water, instead of gravel, and the bin on top was about empty.

The gravel is a hard blue cement, with cobbles and boulders varying in size from hen's eggs to rocks that must be broken up before moving, although but few of the latter were encountered, the majority being readily handled.

We were informed that it would be impossible to work the mine "on account of the boulders," and that "one-half the time was required hoisting rocks," but that the gravel was good, but "about in the proportion of mortar in a brick wall," and many other discouraging aspersions. The reason for so much time being occupied in hoisting boulders under the old regime was soon discovered—large chambers being walled up along the gangway—an old trick—and to all appearances, at first sight, a solid mass.

Behind the wall, however, where rocks should have been stored from bedrock to roof, was nothing but space, and throughout the old workings the boulders

were not built up to the roof, in places sufficient space being found to enable one to crawl in over them, all of which space, however, was utilized later for its proper purpose.

From the character of the ground, the use of hammer drills was discontinued, for the reason that too many holes were lost by coming into contact with rocks, the size of which was uncertain, and after considerable labor in trying to get through or break one of these hard rocks, unsuccessfully, it would frequently be necessary to start a new hole.

As a substitute for drills, the "gopher bar" was used with marked success, as with this tool a hole can be easily turned aside a little, until the size of the rock has been determined, when the drill can be used, either to break or work through it, and in many cases it will be possible, by a slight deflection, to continue the hole past the obstruction without resorting to the slower method of the drill.

Drifts were laid out crosscutting the channel at regular intervals of about 60 feet, that being the most economical length of breast for the accommodation of two miners, and for handling material, requiring less track work and moving of platforms.

Beginning at the center, after the end connection between drifts is run, forming a rectangular block of ground, the miner works to the drift and back to the center, breaking out the gravel, separating the boulders, and throwing the milling dirt on the platform, ready for the car man, who also when loading his car removes as far as possible the large cobbles and sends up only such material as will pass the grizzly.

The occasional larger pieces remaining on the grizzly are broken up or removed by an attendant when the opportunity offers.

It was found advisable, owing to the distribution of the gold, to work out the gravel to a height of 5 or 6 feet—a very comfortable height for men to work; bedrock is cleaned as the breast advances, and all rocks are piled back and built up compactly to the roof, an occasional post and cap being used when the roof shows any signs of weakness; but, by keeping the rocks well built up, the use of timber can be reduced to a minimum.

Of course, conditions will vary, but in this case no trouble was experienced in supporting the roof, which was found to be exceptionally favorable, it is true, and less than 100 feet, linear measurement, of posts were required for an entire season's work.

In passing, it will be in order to say that careful consideration and study should be given to the plan of underground development, and the conditions under which the work is to be carried on and all details in connection therewith laid out in accordance with a prearranged system, both as to the method of running drifts and opening breasts, and also in handling material, the main object being to accomplish the latter with the utmost expedition and with the least amount of dead work—in other words, with the greatest economy.

Each shift, when beginning work, cleans up the dirt and removes the boulders thrown down by the last round of blasts fired by the previous shift upon quitting work, and puts in a round of holes to be fired just before luncheon, during which time the mine will be thoroughly ventilated and the obnoxious fumes of the powder entirely removed; the last half of the shift is similarly employed, the blasts being fired upon leaving the mine.

The kind of powder used was the No. 2, 40% nitro, which was found to be more satisfactory generally, and while black powder in this kind of ground seems to shatter and break up the cement a little more, the convenience of handling the first named finally decided us in its favor.

It is of the utmost importance that all details of the work be arranged systematically, for upon the proper performance of the same depends, in a great measure, the degree of success attained, the other elements of success being the presence of gold in paying quantities, and adequate means for saving it, which will be described in another article.

Without a system the running of the mine becomes a sort of go-as-you-please, haphazard affair, that is rarely successful from the investor's standpoint; therefore, we reiterate, study the conditions carefully, perfect the system, select a foreman who can carry out the arrangement, and you will accomplish the best results.

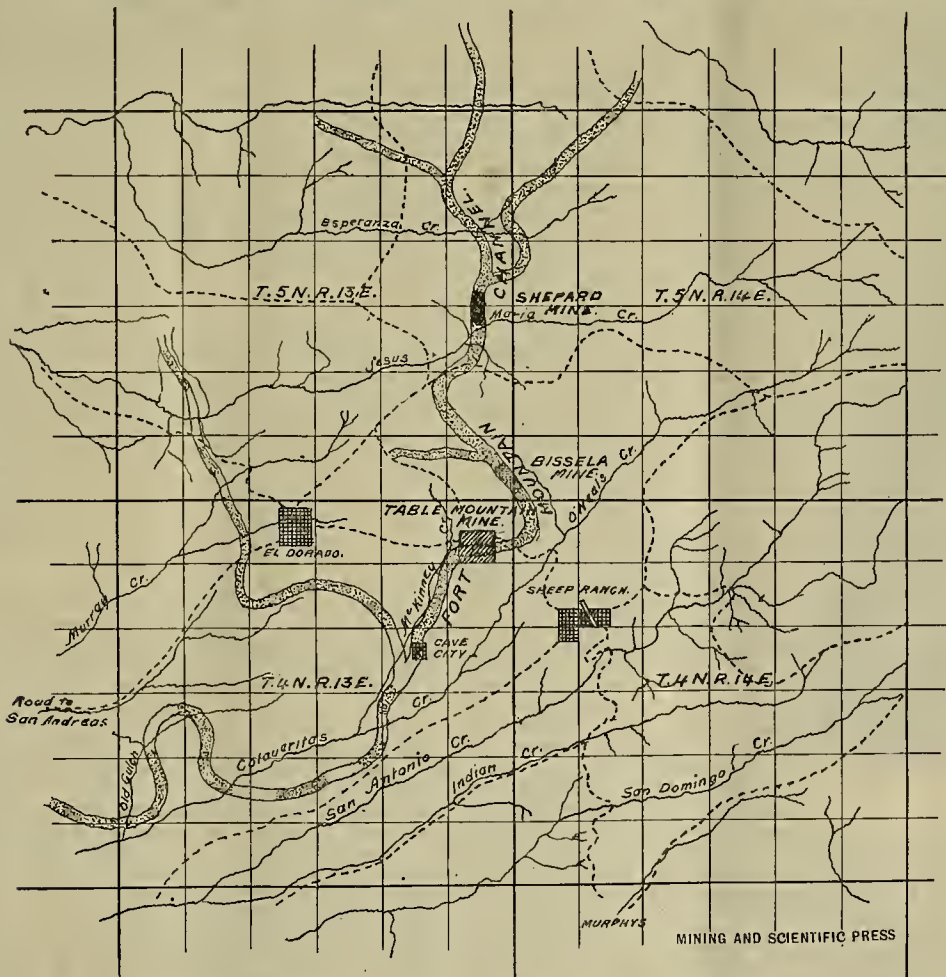
(TO BE CONTINUED.)

Raising a Smokestack.

I had the job to raise a stack 40 inches in diameter and 90 feet long, writes a correspondent in the Wood Worker. As the work was done with nothing but a set of 3/4-inch blocks and a barely sufficient amount of rope, the details may be of sufficient interest to others similarly situated.

The stack, with the wire guy lines attached and all swung clear of the ground, weighed 2200 pounds, and had to be raised to the top of the boilers and breeching, at a point 15 feet above the ground level. This made a total height for the top of the stack of 105 feet.

The first thing to be done was to get a gin-pole for the stack, and as we were in a pine forest, it would seem an easy matter. But trees that will make good sawlogs will not make a gin-pole, for those that



Map of a Portion of Calaveras County, Cal., Showing Fort Mountain Channel.

are straight enough are liable to be too heavy, so we were nearly a mile from the mill when we found a tree straight and slender and of the right height.

The length of the gin-pole needed for this particular job was 66 feet net. Taking half the length of the stack, 45 feet, and add 2 feet for the overbalance, makes 47 feet. To this must be added the height to the top of breeching, 15 feet, making 62 feet. To this add 4 feet for block and rope clearance, making a net length of 66 feet. This length will cause the cry of "two blocks" just before you are in a position to slip the stack on the breeching, so it is best to add 4 feet as a factor of safety, making the pole 70 feet long. This we did, cutting the stick 70 feet from the straight end of the top, as far up among the limbs as it was deemed prudent, leaving the heavy butt at the stump.

Next thing to get was a jack-pole to raise the gin-pole, and following the same line of calculating, it took 35 feet for half the pole, 2 feet for balancing, and 6 feet for clearance, making 43 feet for the jack-pole. This was easily obtained near the larger pole, and when the two were brought together it was a fair load for an ox team. But we were miles away from the camp of loggers and it would take two days to get a team; meantime work was waiting on that stack.

One of the mill "dollies," or rollers, was dragged out to the poles, and turning the dolly over, the two poles were lashed to it at a quarter of their length. With the tackle and 500 feet of line, long hitches were taken from tree to tree, and the two poles ridden into camp in three hours, over a space of a mile, up and down hill and around curves.

Arriving at the mill, it was the work of but two hours to get the poles up and the stack in place, when the raising was accomplished with a windlass made of a piece of one of the poles set between two trees, turned by handspikes, and in seven hours from the time the poles were cut a mile distant from the mill, the stack was up and the guys fastened. Be dead sure your guy ropes are long enough; if not, you are very apt to drop the stack before it is in place.

The Kinkead Mill.

Herewith is illustrated a portion of the Kinkead mill. Concerning the improved Kinkead mill, the manufacturers say that on the Comstock, under the inventor's direction, "it has been crushing practically the entire output of the Con. Virginia mine." It is now placed on the market by Henshaw, Bulkley & Co., who have the rights for the continent of North America, including Mexico and Alaska. The princi-

chrome steel shoes bolted thereto. The inventor claims for the mill economy of power, and that about 2½ H. P. will run the mill at 150 revolutions per minute on hard quartz, crushing from ten to twenty tons per twenty-four hours, according to screens used, friction being reduced to a minimum, as pounding or hammering are impossible, and the large screen surface (6 square feet) and its continuous discharge permits the pulp to leave the pan as soon as it has reached the desired fineness. The manufacturers say: "The shoes and dies wear with surprising equality and evenness, and will last over a year. The peculiar movement of the mill scours the free gold and renders it more susceptible to amalgamation. In addition, the weight of the mill (6500 pounds), and the fact that it runs without any other foundation than ordinary mudsills, makes it a device that can be easily and cheaply installed anywhere." The heaviest single piece weighs but 1900 pounds. The mill is on exhibition at Henshaw, Bulkley & Co., Cor. Fremont and Missions Sts., San Francisco, Cal.

Economical Mining Method Required.

TO THE EDITOR:—Under the above heading a Colorado correspondent asks for information as to the cheapest way of extracting ore by stoping from a vein that caves readily and which is too low grade to afford the using of timbers.

It is well to bear in mind that many ledges are being worked which could not be made to pay if timbers, and labor as well, were given free of cost.

The cost of timbering rarely exceeds \$1.50 per ton and falls as low as 10 cents for timber used to each ton of ore extracted. This is figuring lumber at \$20 per M.

Every miner of experience knows that nothing equals broken rock and earth for filling up the cavity made in a vein after the ore is extracted; but in order to work economically by the filling system alone certain natural advantages must exist in the particular mine that is to be worked, and a system must be pre-arranged in order to work it properly along this line. The vein must stand sufficiently vertical to allow the filling between walls to drop by gravity from level to level. The walls should not be extra hard nor the vein filling very soft.

A flat vein is very expensive to work by this system. The flat "contacts" of Leadville, Colorado, for instance, are timbered with square sets on the Comstock, Nevada, plan, and could not be worked successfully in any other way. On the contrary, the Silver Lake mines, near Silverton, and the Revenue Tunnel properties, near Ouray, in the San Juan district, Colorado, are nearly vertical veins from 8 to 20 feet in width between walls; both these properties are situated at a high altitude, being above timber line, and as timbers must be carried up hill many thousands of feet, as little of it as possible is used. Nevertheless it has not been found possible, nor considered advisable, to even try to dispense with timbers altogether. The main gangways are securely and heavily timbered, chutes are put in about 30 feet apart and made of 8-inch round cribbing 4x4 feet in the clear and carried up as stoping proceeds. The filling material is secured by blasting down the walls and by crosscutting them where necessary; the main object which is always kept in view is to keep the stopes filled to within 5 or 6 feet of the roof; this is a very important though frequently overlooked point.

If your miners are compelled to erect a high and often unstable staging to get at their work of drilling the roof, half their time or more will be wasted in "sounding" loose slabs and watching for caves. To get your money's worth in labor from your miners they must be made to feel that some one competent to know is looking after their personal safety. Divested of all sentiment, it pays returns in dollars. No man with the proper stuff in him will compel another to work in a place too dangerous for himself. It has been said that a mine which will not pay to timber will not pay a dividend, and as a rule it is true, for the preliminary expense connected with putting a mine in shape to work without timbers often costs more than timbering. Many large mines have surface quarries and make expensive chutes from them into the ore stopes below; this is not always done to save timbering, nor as a matter of economy; it is often a matter of necessity and done to hold up ground, already timbered, which is beginning to weaken. A cheap method of working one mine may be a dear one in another. We have to come back to the axiom, "Each mine is a problem

unto itself;" there is no hard and fast rule which applies to the working of all mines alike. A certain amount of inventive ability is required in the mental makeup of any mine worker; difficulties present themselves from day to day which must be overcome, and quickly, but life is too short to be continually trying new experiments in the face of the fact that the mill or smelter must be kept going, that the board of directors growl at the expense, and forgive no mistakes, and the clamor of stockholders for dividends must be appeased. This is where experience comes in, and a knowledge of the successes and mistakes made by ourselves and others in the past is of more benefit than our gilded, untried plans, our hopes or our wishes.

Sonora, Cal., Dec. 24.

CHAS. L. LANG.

A Study of Amalgamation Methods, With the Object of Avoiding the Loss of Mercury.*

NUMBER III.

By MICHAEL BUSTAMANTE, JR., M. E., City of Mexico.

The exact estimate of the quantity of sulphate of copper to be employed is of great importance. If too little is added, the treatment is checked; the sulphate is converted into suboxide of copper; and the mercury, floured and oxidized, cannot be easily recovered by washing the torta without some injurious change in the compounds of silver.

If, on the other hand, the sulphate be in excess, the chloride reactions are very energetic, the mercury being rapidly converted into chloride (with liberation of 62.8 calories of heat); whereas, the formation of silver chloride (liberation only 29.2 calories) cannot take place. By subsequent reactions and outside influences, among which are the admitted effects of light and organic matter, a portion of the mercury is converted into an oxide, which is, like calomel, almost insoluble in the more or less concentrated solution of salt to which the principal reactions of the patio process are ascribed. A considerable loss of mercury is thus caused; and the compounds of silver are so transformed or rendered inert as to hinder their reduction, and produce the indications known to the workmen as those of "hot" treatment.

The addition, as a remedy, of lime, ashes, precipitated copper, etc., cools the torta, and destroys the calomel which may have been formed; but it neither reduces the oxidized mercury nor modifies the passivity of the argentiferous compounds.

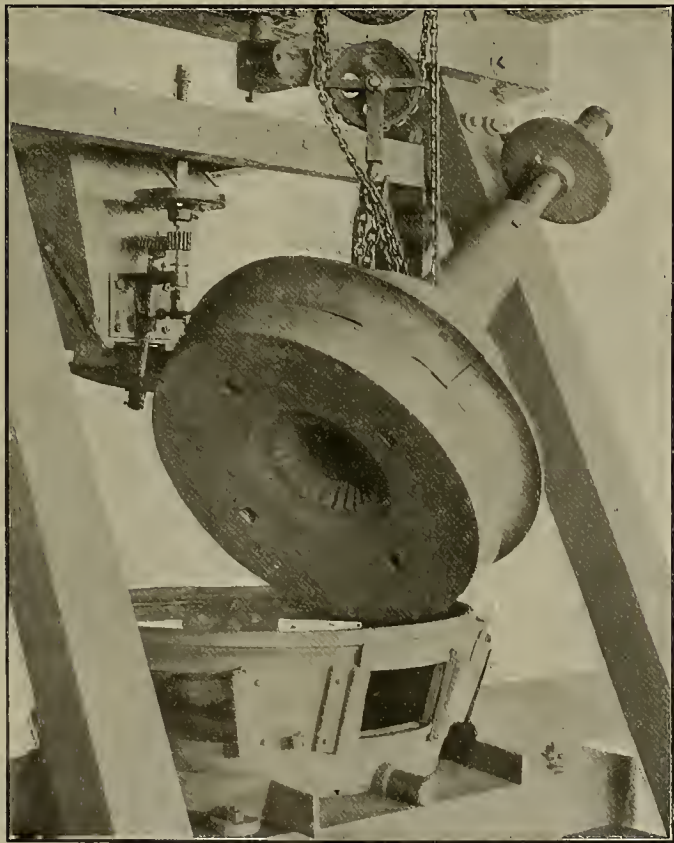
All the current theories of the patio attribute to cupric or to cuprous chloride the chloridization of the silver in the ore—the copper becoming a sulphide or sulph-antimonide, etc. But many trustworthy laboratory experiments have disproved this proposition. The test is not difficult. Place pure pulverized argentite in a beaker; add cupric chloride in more or less concentrated solution; and the result is nil, as could have been foretold from the principles of thermo-chemistry; since the heat of formation of the chloride of silver is only 29.2 calories, while that of cupric chloride is much greater, namely, 71.2 calories. Adding chloride of sodium makes no difference, even after three months. But on the further addition of iron, or metallic zinc in shavings, an almost instantaneous reaction follows; and the more intense the light during the experiment the more energetic will be this reaction. The black silver sulphide is changed to white. This reaction, no doubt, led Kroncke to employ the cuprous chloride in the method which bears his name. When an excess of iron or zinc is added, the energetic reaction rapidly deposits metallic silver—which is not surprising.

This experiment, studied in the light of Berthelot's thermo-chemical law, confirms the conclusion that the reaction is not a simple chloridization of the silver by the cuprous chloride (the formation heat of the latter being but 29.2, while that of the former is 62.2 calories), but is in large part due to the metallic iron (or zinc). This conclusion can be further supported by similar experiment, in which cuprous silver is used instead of cupric chloride. The resulting reaction is very slow and insignificant.

On the other hand, the hypothesis of the effective agency of the iron encounters at once the objection that, apart from American pan amalgamation, the various silver amalgamation processes do not involve a large consumption of iron; and, moreover, that they produce silver of much higher purity than that obtained in pans, which rarely assays as much as 0.750 fine. It is true that the crushing of ore with modern apparatus exposes it to a certain quantity of iron; that the animals which tramp the tortas are shod with iron; but these factors cannot be significant; since, both formerly and to this day, crushing in stone arrastras and the tramping of the torta by men are performed in remote mining districts of Mexico, with technical results not greatly, if at all, inferior to those of more modern practice.

These objections led me to a series of laboratory experiments which, I think, demonstrate (1) the formation of ferric chloride (Fe_2Cl_6), the formation heat of which, in solution, is 255.4 calories; (2) its subse-

*Transactions Am. Inst. Min. Eng.



Kinkead Mill, Muller Lifted.

ple of the mill is described as being extremely simple, consisting of a cast iron pan fitted with a false convex bottom of chrome steel. A muller, to which is bolted a chrome steel shoe, is, by means of a crank above, given a circular gyratory motion. The ore is fed automatically through the center of the muller, and, having reached a sufficient fineness, is splashed through the screens that surround the pan. The illustration shows the mill with muller lifted and with

quent reduction to a lower chloride, with liberation of chlorine, which, acting in the nascent state upon the compounds of silver, transforms them into chlorides; (3) the reaction of these chlorides upon the hydrated oxides in the mixture of ore and reagents, and on the metallic iron, if resulting in metallic silver with a new formation of chloride of iron, releasing oxygen, and probably affecting a partial regeneration of sulphate of copper; (4) a new formation of chlorides of copper and a continuation of these reactions until the termination of the treatment. This is a resume of my theory of the patio process.

What is the role of the copper in these reactions? Its presence is certainly indispensable. It has always been supposed to play the double role of the chlorination of the compounds of silver and its own sulphatization. As to the latter reaction: the formation heat of the sulphate of silver is 3 calories; that of the sulphate of copper 20.8 calories; and that of the sulphate of iron, in the most unfavorable case, 41.6 calories. Undoubtedly, therefore, if iron oxide be present, this last reaction will be the one to take place. The state of division of this sulphate of iron; the liberation of oxygen in the formation of perchlorides from the oxides of iron contained in all ores; the humidity; the action of light and of atmospheric agents; all contribute to the formation of the sulphate of iron, liberating 94.4, and not to that of copper, liberating only 57 calories. This is only an application of the well-known principle of "maximum work."

Continuing, the formation heat of the chloride of sodium (ClNa) is 58.5; that of sodium sulphide, dissolved, 186.8; that of iron sulphide 94.4, and that of copper sulphide 57 calories. The latter, therefore, will undoubtedly be most easily attacked by the chloride of sodium, since it requires the smallest number of calories to make it resign to the sodium its sulphuric acid, with formation, undoubtedly, of protochlorate of copper, which liberates 71.2 calories.

This simple comparison of the formation heats shows at once the usefulness of the sulphate of copper in the patio process, and also explains the small success of those experimenters who have, in practice, substituted sulphate of iron. The presence of copper is, moreover, of the utmost importance for the preservation of mercury in the metallic state, after the oxides of iron have been transformed into protochlorides; the formation heat of the corrosive sublimate being only 59.6 calories.

It remains to be explained why the "magistral" (i. e., the sulphates of copper and iron obtained by the reverberatory roasting of chalcopryrite) yields, in this process, better results than the English sulphate of copper, chemically the purest in the market. This explanation is simple and completes my theory of the patio process.

All those who have practiced photography have witnessed the effect of light in reducing the silver salts and transforming the proto into the per salts of iron; also the strong solvent action of iron perchloride upon the salts of silver—especially silver chloride, whether it has or has not been affected by light. This solvent power of iron perchloride upon silver chloride is greatly superior to that of the chloride of sodium, though the latter may be more generally known; and it naturally facilitates and accelerates the reactions in the patio. In particular, the chlorination and consequent loss of mercury is diminished, for two reasons: (1) Because the quantity of chloride of copper formed is made relatively small, and (2) because the proto and perchloride of iron immediately formed, instead, from the sulphate of iron of the magistral, directly aid in attacking the argentiferous compounds.

The reduction to silver of the dissolved chloride may be effected either (1) through the precipitation of silver as an unstable oxide by the oxides of iron naturally existing or artificially formed in the ore, or (2) by the conversion of silver proto-chloride into perchloride, leaving free silver, which amalgamates with the mercury, eluding in this way further chlorination and solution. Consequently, mercury should not be chemically lost in this treatment. In fact, the necessary chemical loss has often been shown in practice to be imaginary. The mechanical loss is the only inevitable one.

(TO BE CONTINUED.)

Vanadium.

For some time past the metallurgical world has been busying itself with the peculiar properties of a new alloy of steel called vanadium steel.

It appears, in fact, that if this little known metal be added to steel even in such minute quantities as $\frac{1}{10}$ or $\frac{1}{5}$ of 1%, it confers upon it most remarkable qualities. According to the Journal de l'Electrolyse, the coefficients of resistance of both iron and steel, under all conditions, as of concussion, compression or elongation, are raised from single to double their value by the addition of vanadium; at the same time, its presence renders steel so hard that the union of all these new qualities warrants the reduction of armor plates to half their ordinary thickness. It is indeed difficult to admit that the presence in an alloy of iron or steel of $\frac{1}{10}$ or $\frac{1}{5}$ of 1% of any element what-

ever could have such an intensifying effect and at the same time be so general, which effect is explained by the extreme affinity, under certain circumstances, which vanadium has for oxygen.

This affinity is so powerful that if vanadium—even infinitesimal quantities—he present in a bath of steel in a state of fusion, it will lead to an immediate and absolute reduction of every trace of iron oxide existing in the mass. To these traces of iron oxide in steel prepared with the utmost care, and inevitable without the use of vanadium, is attributed the tendency of steel to crack and rupture.

A singular characteristic of the vanadium steel is that it does not acquire the maximum hardness through tempering, but by reheating to 700° or 800° C.

A variety of consequences occur from this fact. For example: A planer, of which the cutting tool was made of vanadium steel, was set to work at its full capacity as to velocity and power. In a short time the tool began to warm, it even reached a red heat, yet it continued to take off the same chips of wrought iron or castings without showing the least effect from the intense heat. It is scarcely necessary to remark that in such a case a tool of ordinary steel would have completely lost its temper and ceased to further cut the casting.

For projectiles this property is of peculiar importance, for we know that the impinging of a projectile upon an armor plate raises the two surfaces to an intense heat, even to fusion. If, by the presence of vanadium, this elevated temperature does not cause the points to lose their hardness, and, consequently, their sharpness, the penetrative power of the projectile will be greatly enhanced. There will undoubtedly be many applications of vanadium. From a military view point, which interests us above all else, this one use of vanadium will revolutionize the making of armaments, as well as the manufacture of heavy projectile. Incidentally, we may add, it will lead to the manufacture of casques and cuirasses which will be at once light and bullet proof. At one time it cost 130,000 francs to produce one kilogram of vanadium; the reduction process has been so much simplified that the same weight of the white metal can now be bought for 150 francs.

Buffalo Pitts Road Locomotive.

Self-propelling vehicles are in growing demand, and mine owners, contractors and others are generally adopting traction engines for their usefulness and economy. The Buffalo Pitts Co. are furnishing a road locomotive that is used in many different countries under varying conditions. An illustration of one of their makes appears herewith. This engine weighs eleven tons; it will pull from twenty to thirty tons, according to the road and grade, the traction power being, of course, greatest where the engine will not sink in the mud nor slip and where the grade does not exceed 10%. The machine is made of tested material, the grates made to burn wood or coal; the water and fuel storage consisting of tanks with a capacity of 400 gallons water and 1000 pounds coal. On a good, level road the water would carry twenty tons ten miles, and the coal about 20 miles. With eighty pounds M. E. P. on the piston, and 500 feet p'ston speed per minute, the engine is capable of developing 83 H. P. On the second countershaft a compensating gear enables the engine to turn sharp curves without slipping the road wheels. The rear road wheels have steel spokes and rims; diameter of wheel, 72 inches; standard width of face, 20 inches, but made wider, if desired, to suit special conditions. The front wheels are built up in the same way and of the same material, 46-inch diameter, 10-inch face.

The Buffalo Pitts Co. have been established sixty-six years; they have been building traction engines twenty-five years and say that they have constructed over 5000 of them. Their address is 31 Carolina St., Buffalo, N. Y.

An Ore Chute and Bins, Lassen County, Cal.

The elevated tramway, with ore chute and bins of the Golden Eagle mine, the property of the Lassen M. Co. of San Francisco, Cal., at Hayden Hill, Lassen county, Cal., are shown in the accompanying illustration. The tramway is constructed of peeled pine poles, with such sawed lumber as was necessary. Since the photograph was taken from which the half-tone was made a 125-ton cyanide plant has been built



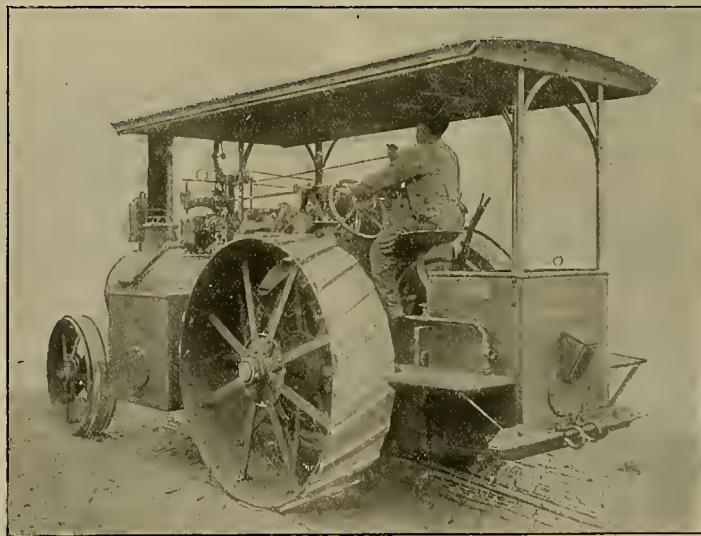
Ore Chute and Bins, Golden Eagle Mine, Hayden Hill, Lassen County, Cal.

on the hillside below the bins, and is now in operation. The tramway and bins were built several months before the construction of the cyanide plant, but were located with reference to the future installation of the plant, showing foresight on the part of the management.

A Type of Desert Deposit.

TO THE EDITOR:—There is a type of metaliferous deposits in the desert regions of California and Nevada that is characterized by being exposed on hillsides, and consists of pockets or kidneys of ore of a greater or less extent. Sometimes these masses contain many thousand tons of ore and at others only a few tons. It would not be fair to the owners to name any specific examples, but these deposits are familiar to all prospectors on the desert, although their origin and possible continuity are puzzles even to those well acquainted with such problems. Various explanations have been given to account for these deposits, but none that I have heard fits the facts as well as the following:

The most characteristic examples are those in the limestone or at the contact of limestone and granitic rocks. That these deposits are more recent than the limestone is evidenced by the fact that while the formation is broken and twisted, the ore deposits are



Buffalo Pitts Road Locomotive.

regular. That these deposits were formed by circulating water there is little doubt, but why in any particular spot?

From studying many of these deposits I have come to the conclusion that they are the results of dried up springs, that is, that the waters of these springs carrying mineral in solution have dried up on coming in contact with the dry desert air, leaving the minerals at a more or less distance underground, accord-

ing to the amount of water and the heat at the surface. If there was sufficient water for the springs to flow from the ground comparatively little mineral would be precipitated, but, as they dry at or near the surface all the mineral is left in the ground. In years of big rains these springs would run and dissolve out enough of the limestone to make space for further deposition.

That these deposits are now forming I have little doubt, for I have seen just such places, characterized by an alkaline stain on the surface, damp generally in the morning and dry during the day. One place in particular was quite close to and between two deposits of red hematite carrying fine crystalline gold, some silver and copper, and on the same horizon, and although at the time I did not think of testing the ground, I have no doubt that a deposit of mineral is forming at that place.

These deposits are difficult to trace underground beyond the limits of the mass, for while the area of deposition near the surface may be quite large, the passage for the solution from some distant point underground may be quite small, in fact only a crack in the formation along which the conditions for ore deposition may have been favorable.

The practical application of this theory in mining is to follow the ore mass as carefully as possible and do not go floundering about with shafts and crosscuts to cut a possible extension or find the original body of ore.

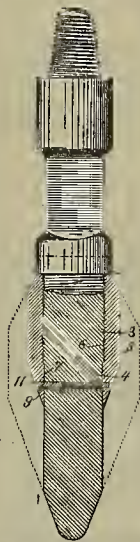
ALGERNON DEL MAR, A. R. S. M.
Pasadena, Cal., Dec. 28.

Mining and Metallurgical Patents.

Patents Issued December 23, 1902.

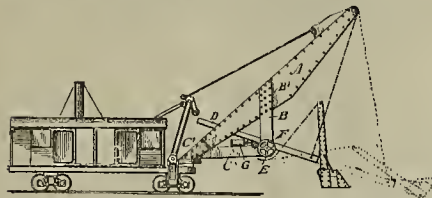
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

WALL CASING SWAGE.—No. 716,466; E. North, Los Angeles, Cal.



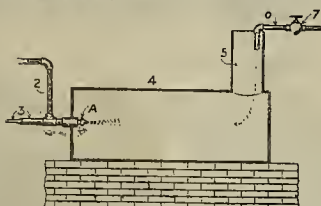
A well-casing swage comprising mandrel having shoulder, screw-threaded portion below shoulder and cylindrical portion below screw-threaded portion; an internally-threaded collar screwed onto screw-threaded portion of mandrel and against shoulder and furnished with internal cylindrical portion which fits on cylindrical portion of mandrel.

STEAM SHOVEL OR EXCAVATING MACHINE.—No. 716,538; C. M. Harrison, Napoleon, Ohio.



In excavating apparatus combination of main boom having bracket extending below and forward therefrom, secondary boom mounted to reciprocate upon "axle" in bracket, shovel pivotally connected with secondary boom and means for operating shovel and boom.

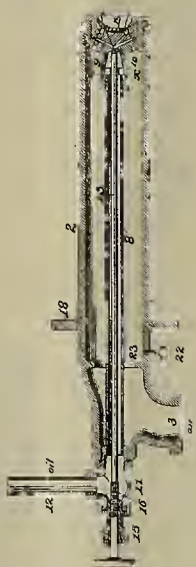
OIL BURNING FURNACE ATTACHMENT.—No. 716,486; J. R. Scott, Oakland, Cal.



The combination with oil-burning furnace and burner jets discharging into front thereof, of counter

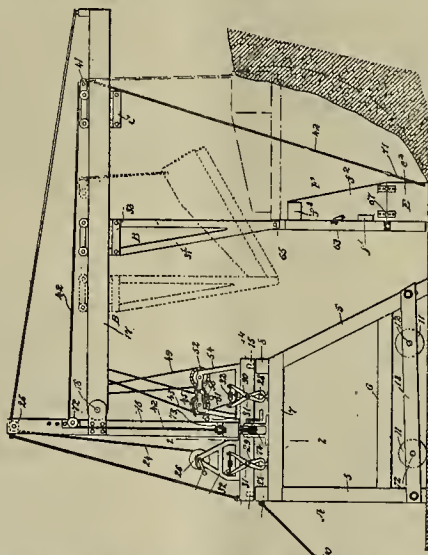
jet air or steam discharging into chimney or outlet of furnace in direction opposite to outflow of products of combustion.

OIL BURNER.—No. 716,724; V. F. Lassoe, New York, N. Y., and L. D. Lovekin, Ardmore, Pa.



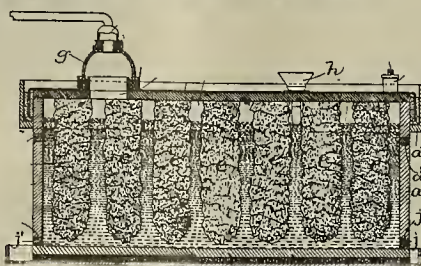
In oil burner, combination air tube, bushing structure fitted into the front end of air tube and consisting of front and back portion forming shallow oil chamber between them and having series inwardly-directed apertures through front and rear walls and opening at front into recessed portion so that several jets may directly impinge upon each other, and oil-spraying nozzle provided with valve feeding oil as spray under pressure into chamber whereby oil is spread in chamber into thin film and atomized by air jets forced through apertures.

EXCAVATING MACHINE.—No. 716,741; C. C. McBride, Redding, Cal.



In an excavating apparatus, combination of traveling carriage having vertical mast, boom attached to mast and projecting forwardly beyond mast and carriage, boom adapted occupy overhanging relation to end face of bank and affording track surface, means for supporting and adjusting carriage and boom for movement in path across, and parallel to end face of excavation, a shovel carrier adapted to track of boom and arranged to travel toward and from carriage, shovel having hinged connection to shovel carrier, and means for operating shovel carrier and shovel individually or collectively.

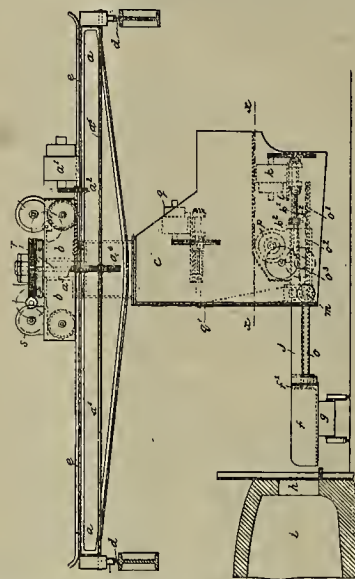
APPARATUS FOR PRODUCING CAUSTIC SODA BY ELECTROLYSIS.—No. 716,804; E. A. Allen, Rumford Falls, Me., and H. K. Moore, Lynn, Mass.



A cell of character described, comprising non-conducting vertical diaphragm, sufficiently porous to permit percolation of liquid, suitable anode, and

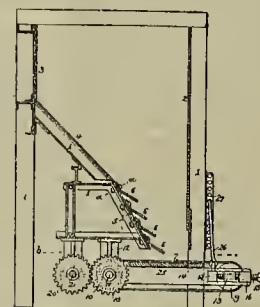
cathode in contact with outer face of diaphragm, cathode being formed of porous layer of such thickness as retain body of liquid in pores, whereby sodium deposited in cathode converted into hydrate by water of undecomposed solution which has passed through diaphragm, and electrolyzing of undecomposed solution in pores of cathode is completed as it flows there-through from edge to edge.

MACHINERY FOR CHARGING STEEL OR LIKE FURNACES.—No. 716,750; A. Patterson, Cardiff, England.



In machinery for charging furnaces, the combination of a suspended frame, means for gripping charging-box into furnace, and means carried by frame for operating ram.

ORE STORAGE AND DELIVERY BIN.—No. 716,769; J. W. Seaver, Cleveland, Ohio.



A bin for storage and delivery of ore or like material, bin having delivery-throat, one wall of which presents step-like formation in plane inclined in respect to opposite wall, steps being separated from each other vertically by fixed spaces into which descending mass of ore can expand.

TREATMENT OF ORES CONTAINING PRECIOUS METALS.—No. 716,847; F. W. Martino, Sheffield, England.

The process of separating noble metals from ores containing tellurium, selenium, sulphur, arsenic, antimony, tin, phosphorus, consists in heating mixture with barium sulpho-carbide and treating it with water, dissolving out the soluble sulphides.

Portable Forge.

The Cumming portable forge illustrated herewith is manufactured by D. Cumming at his manufacturing plant, 787 W. Kinzie St., Chicago.

This forge is a simple one, but indorsed by users as capable of fine work. It has no chains, leather belts or bellows, and it can be easily taken apart and put together again, the parts being all adjustable. When taken apart the heaviest piece weighs twenty-eight pounds, the basin being 18 inches in diameter. There are no breakable parts, nor any to be affected by weather. The basin and pipe are steel, the legs of gas pipe. The maker says it gives a strong, steady

blast, equal to 42-inch bellows. Basin can be slipped off and hose attached to pipe for ventilating, expelling powder smoke in mines. Total weight ninety pounds, height of basin from ground 30 inches. This forge is reported to be in use in many mines and smelters.



Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The oil well at Kayak after spouting for a week has again been plugged and nothing more will be done on this well this season, says the Valdez News.

ARIZONA.

COCHISE COUNTY.

W. Short, of the Short & Mead mine at Cabalona, 22 miles from Douglas, reports a strike in their mine at 182 feet. The ore carries copper, gold and silver.

The Republican says there is a great deal of ore that will come to Douglas from the different mines near Fronteras when the new smelter is ready to receive it.

The Calumet & Pittsburg Co. is down 950 feet on its property and has reached the water level. Work will be resumed as soon as the pumps are in place.

COCHISE COUNTY.

At the Tombstone Con. M. Co. at Tombstone the miners at the combination shaft are clearing drifts in the lower level and making connections, while a number of men are doing preliminary work on the Silver Thread, Comet, Toughout and Lucky Cuss hoists. The company has been hampered by the delay in arrival of supplies owing to the congested condition of freight traffic, the most serious being the non-arrival of coal.

COCONINO COUNTY.

The Azurite Copper Co. has property at Willaha station, 30 miles north of Williams. The ore will be treated in their smelter at Williams. The properties will not be mined, but quarried. The ore is on the surface.

The Redner copper mine, by way of Pine creek, is 60 miles above the Grand canyon. The ore is gray copper. The lowest carload taken out of the mine realized \$2500 at the sampling works at Kingman. One shaft is 100 feet and in the ore body.

GILA COUNTY.

The Old Dominion at Globe resumed smelting last week with one furnace, and has since put on more miners. The result of the efforts to lower the water in the shaft has not been satisfactory, owing to mishaps, says the Silver Belt.

The Blade says D. & A. Williamson's copper property, at the mouth of Dripping Springs wash, has a showing of sulphide ore. They have a tunnel in 150 feet on a vein 30 inches wide, which goes 20% copper, with gold and silver. There are three claims adjoining on which they have prospect shafts.

MARICOPA COUNTY.

The consulting engineer for the Buckeye M. & M. Co., near Bowie, reports the company's new 50-ton concentrator in operation. The test was made on low-grade ore from the dump and produced concentrates carrying \$70 in gold, silver and lead. The mill is running on ore averaging \$16, which concentrates eight to one.

General Manager G. B. Upton of the Oro Grande, at Wickenburg, says he will install a 40 H. P. hoist, air compressor, machine drills, a diamond drill and other machinery. The diamond drill will be used to sink a number of 1000-foot holes on different parts of their property, to test the size and depth of the ore body. The hoist will be placed on the shaft which was sunk 100 feet about 1000 feet north of the main shaft. The north drift is now in nearly this far.

F. McLean and B. V. Hole, of London, Ontario, have a bond on the Powell-Munchas property, near Wickenburg, for \$20,000.

MOHAVE COUNTY.

J. M. Murphy has men at the Pay Roll mine, Chloride. A winze is being sunk on a body of gold ore on the lower tunnel, and a drift is being driven on the south vein.

B. Hastings, superintendent of the Ramrod group of mines near Kingman, is arranging for the installation of a milling plant at the mines.

The Tennessee mine, near Chloride, has reached the 600 level, at which point a station is being cut. An increased supply of water has been obtained for the mill.

The Enterprise M. Co. shipped a carload of ore to the smelter this week. The ore is from the claims of the company near Wallapai Springs.

J. H. Holmes and J. Lane have let a contract on the Wanda mine to sink the shaft now down 100 feet.

The mines of the San Francisco district near Kingman are working full headed. The completion of the road over the mountain gives the mines of the Gold

Road easy access and enables the company to bring in heavier machinery and mining supplies. The site for the Gold Road mill is surveyed. As soon as ore is blocked out and an increase in the water supply obtained, the mill will be started. The Oro Plata mill will be ready for operation in another week.

W. Helmrod will set up a cyanide plant of the Ellis model at Mineral Park. The tailings of the Mineral Park mill will be treated by this method. The process combines both cyaniding and amalgamation.

It is reported that the Hackberry mines, near Kingman, are to start up after a long idleness.

At the Cyclopa property in Gold Basin the cyanide process is in operation. The Senator mine and mill, up the river about 20 miles farther and adjacent to the Grand Canyon, are operating. The ore is hauled 8 miles from the mine to the mill. This mill is the farthest up the river, excepting the Temple Bar.

PIMA COUNTY.

W. K. Maull of Tucson will build a cyanide plant at the Grand Central mill on the San Pedro. The company owns 100,000 tons of tailings. They expect to clean up the bank in three years, working 100 tons daily.

SANTA CRUZ COUNTY.

It is reported that the Nogales Copper Co. will place orders for two 100-ton furnaces, one to be erected at the Buena Vista and the other at the Pena Blanca mines, near Nogales. F. N. Cox is manager.

YAVAPAI COUNTY.

It is reported that a body of ore has been opened in the Gold Dust mine of the Hudson group, near Prescott. The ore is gray copper and runs over \$50 in gold.

The Catocin, on Hassayampa creek, 16 miles from Prescott, is being worked by H. Blauvelt with eighteen men sinking and drifting. The shaft is down 200 feet and a northwest drift is in 200 feet and in ore. Drifting is being done on the 100-foot level. Another shaft 1200 feet down the hill is down 150 feet and a drift started from that point.

A gasoline hoist is to be put in on the Electra mine, near Wickenburg.

On the Lynx Creek placers, near Prescott, there has been considerable activity, says the Herald. Ditches have been dug since the recent rain and snow, giving plenty of water. Five hundred yards from the creek is a gravel bank 300 feet high.

On Hassayampa creek, 16 miles from Prescott, the Quartz Mountain mine is again producing. J. Kompatscher and L. Martin have a two-years' lease and bond on the property, and after driving a cross-cut 370 feet under the old workings have struck the vein. The ore is a sulphide and occasional pockets of telluride have been found.

A discovery of platinum is reported on the Moonlit Wanderer, 8 miles east of Prescott.

CALIFORNIA.

AMADOR COUNTY.

At the Shenandoah, near Plymouth, Superintendent S. K. Thornton says the shaft is down 1000 feet and in the vein.

At the Onelda, near Jackson, pumping is going on steadily from the 2000-foot level, and it is expected that sinking for the 2200 level will begin this month.

At the South Eureka mine, near Sutter Creek, Superintendent Truscott says on the 2300-foot level the north drift is in 140 feet from the shaft and the south drift 130 feet.

CALAVERAS COUNTY.

Work is suspended temporarily at the Salvador, near Jesus Maria.

Manager J. T. Thompson at the Kenross says a shaft is being sunk and work on the ditch is advancing. A number of buildings have been erected. It is reported the Blue Jay will resume. Some work is being done on the Dolphine, the Mauna Bros. mine and the Hamilton property.

A liquidation of 60 cents on the dollar has been made by the Oro Minto M. Co. at Indian creek, near Murphys. The suits pending at Murphys have been dismissed. It is said the Beatrice mine, near Murphys, developed a vein of quartz from 4 to 9 feet in width.

At the Gwin mine the steel head frame is in position and the machinery for the hoist is at the mine. It will be put in position as soon as the foundations are ready.

The Beatrice mine near Murphys has completed installing its machinery and ore is being taken out.—W. B. Lake, of the Echo mine, is having a ditch dug higher up the hill to increase the head of water.—The owners of the Wild Goose mine have finished work on the tunnel for the pipe line. Sinking the shaft is begun.

The Record says work will begin with a gold dredger in a few days on the Stan-

islaus river, from Bostick's bar to Robinson's Ferry. A company has been formed for the purpose and they are putting up a flume. They will start at the lower end and put in the flume to divert the water, and by that means get the dirt and sand down to bedrock. It is to be worked in sections.

DEL NORTE COUNTY.

The Monumental quartz mine on Shelley creek, near Crescent City, is 42 feet wide and carries free gold. The development includes a 70-foot tunnel and a 150-foot shaft. The mine is owned by Baker, Jackson & Hamilton.

EL DORADO COUNTY.

The Republican says the Lucania mine, near Placerville, has closed, owing to a misunderstanding between the mine owners and the parties controlling the water power.

The Larkin M. Co. has been organized to operate the Larkin mine, near Placerville.

The Argonaut mine at Greenwood, owned by J. Smith, has been bonded to Sacramento men.

KERN COUNTY.

The Eastern Con. Oil Co. has incorporated. D. W. Morgan of Bridgeport, Conn., is president. The company has three wells drilling at Kern river.

Supt. J. S. Eggington, the Del Rey Oil Co., south of the Monte Cristo, says they will resume. The Del Rey has five wells. A. W. Craven, superintendent of the St. Paul Oil Co., at Sunset, says his company has completed well No. 1 and will begin another. It is reported that the Queen well at Sunset, closed for some time, has been reopened and is flowing 2000 barrels a day.

The Pittsburg Co. is putting up fourteen derricks at Sunset. More than 100 derricks are being erected in that field. The California Combined Oil Co. has let a contract for a 1500-foot well on section 7-28-28, adjoining the Edgar. The contractors propose to use wire cable, claiming it is possible to drill more rapidly than with the fiber rope.

Near Bakersfield the Claremont is sinking a well. The Associated is now running four strings of tools. Three strings are being operated by the Monte Cristo.

The estimated output of the Kern river field is 25,000 barrels daily, of which 20,000 barrels are shipped and the balance used by local consumers and stored by the Standard, 360 wells being pumped.

NEVADA COUNTY.

T. M. Andrews has taken charge of the Pine Hill mine, near Grass Valley. A 10-stamp mill was recently erected on the Pine Hill; several men are working.

The lessees of the Nevada County mine will resume work and the drift from the bottom of the incline will be extended 300 feet.

PLACER COUNTY.

Superintendent F. R. Hartley has ten men working at the Crandall, below Auburn, sinking a shaft to go 200 feet. They have a 3-foot ledge. The new 10-stamp mill at Black Canyon mine, near Westville, is running.

M. Savage, superintendent of the Deep Canyon mine, 3 miles above Last Chance, says the 5-stamp mill is running steadily.

The Jubilee mine, in the Rock Creek district, near Auburn, is bonded by a company represented by S. T. Nessmith. The company will install \$7000 worth of machinery. The Santa Fe mine at Canada Hill, near Westville, has been bonded.

The Boulder mine, in the Ophir district, has resumed after a shut down caused by litigation. An air compressor has been put in and machine drills added. Twelve men at work.

Buchanan & Norton have started their mine between Auburn and the American river, and buildings have been erected. Six men at work.

RIVERSIDE COUNTY.

The Chicago Co. that bought the O. K. mine near Dale on the Colorado desert will, it is reported, put in a dry crushing cyanide mill. The O. K. mine is over 300 feet deep. J. Sigafus is manager.

SACRAMENTO COUNTY.

The Prosperity mine, Folsom, was compelled to cease operations last week, owing to attachments on the property.

SAN BERNARDINO COUNTY.

The Columbia group of mines, 30 miles west of Manvel, are reported attached for \$3700.

SHASTA COUNTY.

The Modoc Chief quicksilver mine on Clover creek, east of Redding, is reported showing up well with development.

The Mountain Copper Co. is employing a searchlight at night at its property as a precautionary measure.

SISKIYOU COUNTY.

The company which last week bought the Yreka electric light plant intend put-

ting in a larger dynamo to furnish power for the gold dredger at Hawkinsville in Yreka creek, and also to run quartz mills in Yreka and vicinity.

TRINITY COUNTY.

The Sibyl mine near Weaverville shipped nine tons of ore to the Selby smelter last week.

The Lappin mine at Deadwood closed down for the winter on December 10th. The last crushing of 150 tons of ore from the mine, at the Brown Bear mill, went \$33 to the ton. Four tons shipped to the smelter gave \$450 to the ton.

The Journal reports at Bragdon the Keno mine, owned by Thrasher & Rodgers, and the Surprise and Five Pines mines, owned by J. Van Ness, adjoining, have been bonded to Mr. Manning of San Francisco. The Keno has a 2-stamp mill. Fifteen men are at work. The ledge is 5 feet wide, carries free gold and sulphurets, and averages \$10 a ton. A 10-stamp mill will be erected in the spring. A tunnel is being driven on the Surprise to strike the contact and is in 600 feet. Four men are working. On the Five Pines one shift is driving the tunnel to cut the ledge. Mr. Manning is superintending the work.

The owners of the Fairview, on Trinity river, near Minersville, are developing their mine. The ore body was tapped last week in the lowest level and the ledge found to average 2 feet and carry good values in gold. The property was bought last year by San Francisco capitalists, C. Allenberg, Mr. Fontana and the manager of the property, J. H. Porter. A new 10-stamp mill has been built.

TULARE COUNTY.

The Dayton Co., near Angiola, has begun operations in the northwest corner of section 9-23-23, near the Inter Nos. The contract calls for a 1500-foot well.

TUOLUMNE COUNTY.

Manager M. B. Kerr of the Jumper gold syndicate at Stent says he "proposes to connect the 800 level from the Jumper shaft with the 600 level of the Golden Rule. The distance from the Jumper shaft to the Golden Rule shaft is 2000 feet. The ore stoped along the line will be hoisted at the Jumper shaft. All timbers are dipped in heated carboliteum.

At the Dutch mine at Quartz Superintendent Trittenbach says the winze from the 1200 to the 1300 has broken through. With the new boiler, should the water or electric power be again shut off, the mine and mill can be steadily run by steam and with fuel oil.

The Don Pedro G. M. Co. is incorporated to work the properties by that name near Don Pedro bar, the Old Stokes mine being one of the group. The company has its offices in San Francisco. W. H. McClintock is president, S. Sprout, S. T. Gage, C. C. Juster and W. H. Signourney directors.

G. A. Hamilton of Groveland has sold to C. Y. De Lay of San Francisco the Enterprise mine, near Big Oak Flat.

Donohue & Roquet have deeded to W. H. McClintock the Stokes quartz claim, near Don Pedro bar.

W. King has deeded to M. J. Curtin of Sonora the King placer mine, on the Stanislaus river, near Willow bar.

At the Mt. Hood G. M. Co., near Jamestown, stoping is being done from the No. 1 level south. The vein is 12 feet wide. The shaft is sunk in a ravine and there are considerable backs at the point of stoping. A crosscut is being run to the east. The 5-stamp mill is in operation. Five more will be put in. Oil is used as fuel at the hoist. Sinking in the shaft will be resumed this month. J. A. Burkhardt is superintendent.

Superintendent W. H. Turner at the Toledo mine, near Jamestown, says the shaft is down 300 feet and the drift on that level is in 100 feet. The vein is from 7 to 8 feet in width.

Superintendent W. H. Turner at the Rawhide, near Jamestown, says the main shaft has been retimbered and unwatered to the 1500 level, and stoping on the 1200 keeps the 40-stamp mill in operation. The chlorination works have resumed and oil is used in the furnaces. The cyanide works of Robinsons, located on the property, will resume next week.

A strike is reported in the App in the 1100-foot south. The lode is 20 feet wide. The 60-stamp mill is running principally on this discovery. Superintendent Turner intends to open up the 1200 and drift on it to get under this shoot.

The Morris tunnel, near Columbia, is being extended to open new ground and tap the Bald Mountain pocket claim. The name of the Monterey Oil Co. has been changed to the Longfellow Con. G. M. Co., and amended articles of incorporation filed with the county clerk at Sonora.

The New Era says the cyanide plant at the Confidence mine, Confidence, is in operation.

The Sunnyside mine, on the Tuolumne river, near Criter, is getting in machin-

ery and the mill will soon be in operation. The 6-inch pipe for power has an 800-foot head.

At the Clio mine near Jacksonville the mill is running. F. Williams is sinking a shaft on a vein recently discovered on the hill opposite the chlorination plant in Black Leg gulch at Sonora.

The Mountain King near Keltz is being developed by a New York company. Manager Bowers is having hoisting machinery put in.

The Mountain Belle mine, $\frac{1}{2}$ mile north of Soulsbyville, is being unwatered. W. Sbarwood of Soulsbyville has a bond on the property.

A 30 H. P. boiler and engine will be installed by the Contention M. Co. of Knight's Creek, near Columbia. It will be used to furnish power for the 5-stamp mill during the dry season.

Rich gravel is reported struck last week by the Woodside Gravel Co. at Springfield, near Columbia. A \$50 nugget was picked out of the pay gravel.

Ten stamps are dropping with electric power in the Mazepa mill, at Stent.

At the Bell mine, Tuttletown, on the 400 level, 200 feet drifts have been run on the ore shoot and mill tests made every 50 feet. The company proposes sinking 200 feet deeper to 600 feet.

A canvas plant has been added to the Gross mill at Tuttletown.

Work at the Free Lance mine, near Groveland, has been resumed.

VENTURA COUNTY.

The Webfoot Oil Co., owning property 15 miles south of Sunset, Kern county, and a mile across the line in Ventura county, has a well down 700 feet with casing 500 feet. The drill is in sandstone.

YUBA COUNTY.

The Elsie mine, near Marysville, is reported sold to Rosenfelt Bros. of San Francisco for \$20,000.

It is reported that the Miller mine at New York Flat, near Marysville, will be reopened by the Minneapolis men who own it.

COLORADO.

BOULDER COUNTY.

The operators of the Black Cloud mine on Gold hill have opened up a vein of gold and silver ore the last few days. The mine has also developed a vein of lead ore which runs 50%. This property has 5000 feet of development.

W. and G. Rogers are operating on the Little Chief group on El Dorado mountain, near Boulder, and in the Little Chief tunnel at a point 25 feet in they have opened a vein of decomposed carbonates lying in a blanket formation between walls of granite and quartzite. A. A. Merrifield of Fort Collins has finished a 30-foot contract on the April Pool in Hicks gulch. The tunnel is in El Dorado mountain 150 feet on the Clara Belle vein, which shows a pay streak 5 to 6 inches wide running an ounce and a half gold. The vein is 10 feet wide, as far as uncovered, carrying sulphides. Merrifield has also a 30-foot contract on the Manila on East Spencer mountain for the same owner. The tunnel is being driven on the vein.

W. P. Bonbright of the Boulder Illuminating Oil Co. says one of their wells near Boulder is pumping. The Boulder field is producing 400 barrels a day, not including their new well, which is expected to add fifty barrels daily.

CLEAR CREEK COUNTY.

C. J. Hughes, Jr., of Denver, has begun sinking a winze from the lower level of the Comstock mine, near Idaho Springs, on a body of mineral. In the fourth level drifting east proved a body of ore, and it is on this that the winze is sinking. He is taking out milling ore. The streak is of the same width and value as opened through the Dove's Nest several years ago and which proved to be in the Comstock ground. That work was stopped and after nine years of litigation the rights were awarded to the Comstock.

A strike is reported in the Great Scott, in Cumberland gulch, owned by Miner, Purdy et al. In following a small vein 600 feet from the mouth of the tunnel a large lode was cut which shows an ore body 8 feet wide, carrying copper, iron and lead. The find will be tested and if values justify a mill will be built.

Cook Bros. of Yankee have arranged to take the Golden Lily mill of twenty stamps and spend \$2000 in improvements.

A new mill is being considered by the Chesapeake Con. Co. of Yankee, says H. Preston, manager.

Ohman & Reynolds are taking out shipping ore that will run \$100 per ton from their lease on the rich surface shoot of the Puritan.

At the Joe Reynolds mine, near Lawson, the tunnel being driven to cut the old shaft to drain the upper workings is in over 3000 feet and last week reached the winze. It will require 600 feet more to reach the shaft. The company will drive 600 feet farther, make an upraise

and thereby drain the mine without danger. The tunnel will be 50 feet lower than the bottom of the shaft. It will also drain the Two Sisters mine.

The Record says the Sylvania, near Idaho Springs, has a 65-foot ore shoot of smelting ore. It is 6 inches wide and runs eight ounces gold. The vein in which this shoot occurs is 3 to 4 feet wide and runs \$20 in gold and silver.

The Gold Coin Co. at Yankee has a mill in operation on its property adjoining the Sweet Home mine.

An organization to be known as the Home M. & Inv. Co. has been formed at Idaho Springs to develop a gold-bearing lode in Spring gulch.

Manager Hartshorn, at the Pacific mine, Georgetown, says the heading of the drift shows 2 feet of ore worth \$50 a ton.

It is reported that a 2-foot vein of ore has been struck in the Phillips lode, near Georgetown. The property is operated by the Pelican-Dives Co. through the Burleigh tunnel. A drift on the vein has been driven west from the tunnel 700 feet. Zinc ore was found mixed with galena, but which had not enough values to be marketable. The Phillips lode is near the Seven Thirty vein and the ore body cut is 1200 feet below the surface.

The Anglo-Saxon M. & D. Co., operating a group of six claims near Georgetown, have a crosscut in 150 feet, and are in quartz. This crosscut is intended to open up the Saxon vein. A number of veins running in an easterly and westerly direction traverse the group.

The Mendota mine at Plume is shipping solid lead ore, having a value of \$40 to the ton. The veins are from 2 to 3 feet in width. A contract has been let by Manager Old for driving 1000 feet of drifts, the third and fourth levels each to be advanced 500 feet from the shaft. The concentrating material of the mine keeps the mill occupied, the product being lead, iron and zinc.

W. Rogers is about to start up the Baltimore, one of the oldest producers in Silver Plume section. The mine has a record of \$1,500,000.

The Kelly tunnel at Georgetown is making good headway toward the lead-gold deposits of Democrat mountain.

CUSTER COUNTY.

The Bassick mill at Querida was three months ago overhauled and remodeled to meet the requirements of the production of the Bassick mine, but it has proven incapable and it is reported that the Bassick Co. will enlarge the mill to 300 tons a day. At the 1250 level three shifts are breaking ore, but the better grade is found on the 1500 level.

The Elematah will resume after a long idleness. The Aburdix G. M. Co. is the owner; G. W. Avery, superintendent.

Machinery will be installed at the Gold Wonder mine, the newest discovery in the district, as soon as it is determined what process is adapted to the treatment of the ore. The property was discovered six weeks ago, one-half mile east of Silver Cliff.

DOUGLAS COUNTY.

J. J. O'Driscoll, of Colorado Springs has bought a plant of machinery at Cripple Creek, which is to be set up on the Apex mine, in the lower Tarryall district, 30 miles northwest of Cripple Creek. The plant consists of a hoist, a compressor and boiler. He claims that at the depth of 150 feet the bottom of the shaft is in copper ore that runs \$100 a ton. This is the second steam plant in the new camp, the other being operated by F. M. Clancy.

FREMONT COUNTY.

The cement works at Portland are in operation, with 1200 barrels daily capacity.

GILPIN COUNTY.

G. K. Kimball, Jr., and L. Hanchett have arranged for the consolidation of the Wautauga and Old Town properties in the Russell district under the name Old Town Con. M. Co. The property has been producing \$15,000 to \$20,000 a month. The Wautauga has been idle for a greater part of the year, due to litigation. Manager Kimball says that the Old Town shaft will be sunk an additional 700 feet, making 1500 feet, with the intention of striking the Newhouse tunnel level, which will require a total depth of 2400 feet.

The Morning Star and Arizona properties, at the head of Elkhorn gulch, near Central City, are being operated by the Boston-Cleveland M. Co. Operations through the Arizona are discontinued and will be carried on through the Morning Star property hereafter. The shaft buildings have been enlarged to 24x60 feet and a new hoist is being put in. The shaft, 200 feet deep, is being retimbered. The company will sink 200 feet deeper.

The Central City Register-Call says a large amount of location and development work is being done on the south slope of Hanna mountain and along South Boulder creek, in whose vicinity the new Moffat

railroad will pass.—The Walter A. shaft of the Tungsten M. & M. Co.'s property, on Jenny creek, is being unwatered.

The Oneida G. M. Co. is incorporated to operate in Gilpin county; A. R. Sexton, E. F. Irish and H. H. Schuler.

Baleria & Co. of Central City, who are working the Homestake mine in Lake district, made a shipment last week to the sampling-works of sulphide copper ores. They will make a shipment of second-class ores to the Golden smelters this week. Both ores are coming from the shaft in sinking and a depth of 300 feet has been reached.

At the Hampton mine in Russell Gulch a shipment of fifteen tons of enargite ores is to be made next week. Several tons of second-class ores are on hand.

Manager J. A. Gilmour of the Stewart G. M. Co., operating in Hawkeye district, near Central City, received returns last week from a mill run of ten cords which ran four ounces gold per cord on the plates. The tailings, amounting to eleven tons, gave \$9 per ton, bringing the ore up to $4\frac{1}{2}$ ounces gold per cord. The ore came from the east 170-foot level.

H. Pool and associates made shipments last week of smelting ore from their lease in the McCallister property, on German mountain, working through the Bobtail tunnel.—Missourians, who own the Old Ann group at the head of Silver creek, gave a contract for drifting last week. The sinking contract is completed and the shaft is down 300 feet.—Increased shipments are being made from the Clark-Gardiner mine on Quartz hill, the product being treated at the New York mill at Black Hawk.—A number of leasers are at work on properties of the Hillside G. M. Co. in Gregory district and regular shipments are being made to the mills.—The ore bins at the Clay County mine in Lake district being filled, shipments have begun.—Leasers working the Puzzle mine on Bobtail hill made shipments last week to the sampling works.—Regular shipments of milling and sampling ores are being made from the Galena mine near Central City. The ores are being shipped both on company and leasing account.—Sinking is being carried on at the East Boston mine with two shifts and the property is shipping ore to the stamp mills. S. Hoskin is manager.

GUNNISON COUNTY.

Operations at the Augusta mine the past year have been confined to development in the 320 level and the driving of a tunnel from the Pittsburg side of the mountain. The 320 level enters from the Dark canyon side and is on the vein 1200 feet, 700 feet of which is in ore. The east 100 feet has been in a body of quartz containing ruby silver and zincblende, which carries gold values. The big tunnel was started a year ago and is in over 1900 feet. The depth on the incline of the vein below the outcrop at the surface will be 1500 feet when the new tunnel reaches it. Several parallel veins have been cut. The Augusta M. M. Co. expects to complete this tunnel next spring, when a mill and a tram line will be built. An electric plant is also contemplated. The mine's output will be 100 tons per day.

HUERFANO COUNTY.

The Chieftain says numerous locations are being made by coal prospectors in the Huerfano valley along the proposed line of the D. & R. G. railroad between Pueblo and Walsenburg, now being surveyed.

LAKE COUNTY.

The Republic S. & R. Co., which will operate the Boston gold-copper smelter at Leadville has filed its incorporation papers. T. Goodwin is manager.

A contract has been let for driving a 700-foot tunnel on the Best Friend property in upper Big Evans gulch, near Leadville. This will be driven along the vein and tap the shaft at a depth of 300 feet. The work is being done jointly by owners and lessees.

The Lillian mine on Printer Boy hill, near Leadville, is producing 100 tons per month of gold ore. Nine men are at work on the block leasing plan.

A heavy flow of water in the Diamond shaft, in upper Evans, Leadville, has been overcome and developments with drifts and diamond drills are again under way. The company is searching for the extension of the deep-seated ore bodies developed in its neighbor, the Resurrection.

Suits against the Boston G.-C. S. Co. have been dismissed in the district court as a part of the plan of that company's reorganization. The suits were brought a year ago by mining companies to recover the value of ore left at the defendant's smelter. At that time the Boston Co. operated a pyritic smelter at Leadville, which had a capacity of 450 tons a day. It closed down in September, 1901, and suits aggregating claims for \$100,000 have since been brought against it. Arrangements have been effected with the Republic S. & R. Co. by which the old plant will be remodeled and work renewed.

LARIMER COUNTY.

It is reported that rich galena has been found in the Big Creek tunnel at Pearl 960 feet from the mouth of the tunnel. The rock is a grayish-white quartz containing a large percentage of copper and galena. The main body of ore is low grade.

OURAY COUNTY.

A syndicate of local capitalists is being formed to work a group of claims lying between and adjoining the Camp Bird and Revenue mines. A number of claims have been secured and negotiations for others are pending. The territory between these two properties is mineralized and there are a number of large veins with good surface values.

The net profit to the stockholders of the Camp Bird mine for October was \$151,000. It is reported that the Camp Bird will erect an electric power plant in Ouray and an aerial tram from the mills to Ouray.

SAN JUAN COUNTY.

In the Bachelor, near Ouray, rich silver ore carrying native silver has been struck. The shipment of ore from the Khedive and Bachelor is equal to the output of the mill. The mill at the Khedive is running and the values in the tailings are small. The process of making two separate products in the mill is a success. The zinc is almost totally eliminated from the other product, which carries the silver, a small portion in gold and the heavy percentage of lead.

SAN MIGUEL COUNTY.

The Smuggler-Union mine stock was brought up from the valley. Seventy-five men are at work. They have cleared away snow and put the mill in shape and stamps are dropping again.

SUMMIT COUNTY.

At Robinson the Ten Mile L. Co. has made a strike in the Dalzell shaft on one of the company's claims. The strike was made on the contact in the bottom of the shaft at a depth of 985 feet last week. The company has for two years been sinking for the Robinson contact and several ore streaks have been found, but drifting proved them to be stringers.

Another strike has been made on the Carbonate claim, near Breckenridge. The locators found the float and drifted 50 feet. A winze was sunk 20 feet and a 22-inch streak of lead ore was uncovered. A carload hauled to the sampler netted \$50 per ton and 60% lead, one-half ounce in gold and forty ounces silver.

The Admiral M. Co.'s claims on Missouri gulch above Frisco will soon have their buildings completed. A turbine water wheel is in position to run the motor for the air compressor and air drills, but the dam in Ten Mile is not completed. A steam plant will be installed for this season. The ore is sulphide, the mill equipped with concentrating tables and a roaster.

The Mountain Pride, on Baldy, near Breckenridge, is working. Manager Findling reports a shortage of water for milling. One shift is working in the mill. The company's output in smelting ore and concentrates is 100 tons per month, which goes to Denver smelters.

The Gold Pan M. Co., near Breckenridge, has received two locomotive cranes which weigh 43,000 pounds each and have a lifting power of two tons on 50-foot radius and six tons at 25-foot radius. The cranes will run on 8-foot gauge and are to be used in the placer operations next summer.

Kokomo mines are shipping steadily. The Colonel Sellers on Elk mountain ships fifty tons of sulphides daily.

The Wilfley mine and mill is working steadily, shipping good grade ore. This mine has made a steady output since 1879 and still producing under management of E. E. Byron.

The Free America on Jack mountain is working steadily and the incline is being put down in ore. F. Linsley is manager and also owner in the property. Zinc ore showing free gold can be seen.

TELLER COUNTY.

The Rocky Mountain M. Co. is pushing work on the three-compartment shaft on the south end of the Delmonico, Cripple Creek district. The property is producing twenty-five tons per week.

Lessee C. Leonard, on the Doctor-Jack Pot property, made a shipment of ore last week from the seventh level to the amount of 544 tons, which returned \$10,000. The company will receive \$4000 in royalties.

The Times says on the Hull City of the Cripple Creek M. Co., Cripple Creek, the lessees are taking out fifty-six tons of ore per day that runs \$30, and have proven the shoot for 600 feet. From the present level they have 300 feet of stoping ground.

The Maria A. G. M. Co. has granted two leases on its property, the south half to J. R. Stevenson and the north half to Toof & Elder. Leases run eighteen months at 20% royalty. Both employ

forty shifts monthly. The Maria A. is in the saddle between Raven and Bull hills, Cripple Creek district.

W. Vnst of Victor has a lease on ground on the Mountain Beauty, Bull hill.

Temple & Rice have a lease on the Van Fleet sampler at Goldfield and are converting it into a cyanide plant. They expect to handle 250 tons daily. They have leases on several dumps of ore that run from \$4 to \$7 a ton, and with reasonable transportation charges expect to handle the rock at \$2.50 a ton.

Moro ore is being sent out from Cripple Creek district mines on the south slope of Bull hill than over before. The showing in the Vindicator is good. At the tenth and twelfth levels there is a shoot proven for 600 feet, and in places the ore body is 15 feet wide. The grade of the ore is about \$20 a ton. On the Golden Cycle there is ore enough in sight to continue the present production of 100 tons a day for some time. On the Hull City placer the Cripple Creek M. Co. has a good showing in the 800 level, some of the ore being rich. On the Trachyte, Deadwood, Delmonico and Shurtliff, worked by lessees, steady shipments are being sent out.

Wilhelm and associates, leasing the Wilson, owned by the Free Colnago Co., have sent out another high-grade shipment of fifteen tons. The last carload averaged \$400 to the ton.

The Mint property on Gold hill, Cripple Creek district, is getting ore from the second level that gives values of two ounces to the ton. The lessees on the third level are driving to cut the same ore shoot as above and expect to reach it by February 1. Lessee G. Bent, working on the Bonanza King on Gold hill, made a carload shipment of two-ounce ore last week.

A. Hickman, on the Sheriff claim on Raven hill, Cripple Creek district, is taking ore from a 4-foot vein that will average \$40 per ton.

It is reported that the property of the Cripple Creek & Colorado M. Co. on Gold hill, of which R. G. Mullen is manager, will resume. A shipment of twenty-five tons returned good values. The ore was broken on the 500 level.

The returns on ore shipped by Lessee Leonard from the seventh level of the Doctor-Jack Pot, Cripple Creek, show that 12 1/2 tons ran 20 67 ounces; 19 1/2 tons ran 7.02 ounces, and 22 07 tons ran 5 48 ounces. The royalty received by the company was \$3756.

The Globe M. & R. Co. has been organized to mine and treat the low-grade oxidized ores of Cripple Creek by means of cyanide. The company has a four-years' lease on the property of the Standard M. Co., also on the Van Fleet sampler. New tanks will be put in. W. O. Temple is manager.

The cyanide mill of Nesbitt & Miller at the Pharmacist, Cripple Creek district, began operations this week.

IDAHO.

ADA COUNTY.

State Mining Inspector Jacob estimates the mineral production in Idaho for 1902 at \$10,924,371 83—gold, \$2,467,233.21; silver, \$5,421,583.62; lead, \$3,035,655.

The copper mines of the Seven Devils district were shut down all year on account of litigation, and other copper property at Mackay, which has a \$1,500,000 smelter, will not begin operations until next spring or summer. Of the total mineral output the lead-silver mines of the Coeur d'Alenes contributed \$6,247,327.

BLAINE COUNTY.

The Minnie Moore, near Hailey, is shipping a carload of ore per day, which runs 124 ounces silver and 80% lead. The vein from which this ore is taken is 9 feet thick. Mr. Rockwell, the owner of the Minnie Moore, has taken an option on the Red Cloud in the same district and has begun work. This mine has produced \$1,000,000 from near the surface.

W. H. Watt, owner of the Democrat, is 1500 feet in on a 3000-foot tunnel, run to catch a vein on a lower level, which produced ore running 120 ounces silver and 60% lead.

The Elkhorn mine has resumed after being idle for seven years.

In the Smokey district the Liberal, a gold mine, owned by Mr. Reed of Boise, with Eastern people, is being worked; also, the Williams Bros. claim, a new group opened up, which shows \$12 per ton.

BOISE COUNTY.

The pumps were pulled from the Washington shaft, near Idaho City, recently. The ore bin was filled, and, being unable to run the mill, the fuel being green, work is suspended until spring.

CUSTER COUNTY.

The Shakespear claim, adjoining the Packer on Loon creek, near Custer, will be developed this winter. In Valley creek the 20-stamp mill belonging to Judge Price has been completed and will

start up in the spring. Work will continue all winter at the mine. The dredge of the Stanley Basin Placer Co. is finished and everything ready for operation in the spring. All work has been discontinued at the property of the Hartford Co., at Custer, pending a reorganization of the company.

FREMONT COUNTY.

W. Hill, superintendent Teton Coal Co., in Teton Basin, says he has opened up a stratum of coal nearly 20 feet in thickness and is now supplying the market of the valley. The vein lies near the proposed railroad through the basin to the Yellowstone National Park.

IDAHO COUNTY.

At the Silver King, near Warren, a tunnel is being run to tap the ledge at a depth of 700 feet. Repairs and changes are being made in the mill.

The Dewey mill, Thunder Mountain district, is running five stamps, the others being hung up because of a broken cam shaft, which can not be replaced until spring.

LEMHI COUNTY.

The Italian mine has been bought by S. S. Vanhorn of Nevada; E. B. Randolph installed as superintendent.

The Gold Dust M. Co. of Leesburg is installing a 10-stamp mill.

SHOSHONE COUNTY.

Owners of the Oom Paul, a silver-lead property near Burke, are driving a cross-cut tunnel, under contract, which is near an ore body. The tunnel is in 800 feet and will give a depth of 250 feet.

WASHINGTON COUNTY.

H. Thorp, superintendent of the Grouse Creek Placer Co., operating the Hathaway hydraulic properties on Grouse creek, in the Marshall Lake district, near Council, says they have stopped work for the winter, being unable to haul supplies.

MICHIGAN.

HOUGHTON COUNTY.

The Calumet & Hecla, at Houghton, has erected pulley stands for emergency hoisting from No. 7 shaft.

The Franklin mill, Houghton, is stamping 1000 tons of rock daily—750 tons from the Junior and 250 tons from the old mine. The conglomerate shaft is sinking to the 15th level. The 7th level drift south is in 1100 feet—100 feet from the site proposed for the new shaft. The new dry, replacing the one recently destroyed by fire, is occupied.

MISSOURI.

It is announced that work has begun on the construction of the Mines and Metallurgy building of the St. Louis World's Fair. The building will stand in the southern part of the main group and will be 525x750 feet, covering nine acres. It will cost \$493,000. With the building erected, it will be necessary for the people of the mining camps of America to see that it is filled, as Dr. Ward has stated, with the best exhibit of minerals ever displayed.

MONTANA.

FLATHEAD COUNTY.

W. J. Beager reports that he has sold the Cedar group of claims on Libby creek to Eastern parties for \$30,000. There are five claims in the group. The ore is said to be free-milling.

MADISON COUNTY.

The White Star group of five claims is handed to Michigan men, represented by F. C. Lavigne. The bond calls for the payment of \$50,000, of which 10% was made as soon as the papers were delivered. The property is near Goodrich gulch, 8 miles from Twin Bridges. The ore is free milling gold and the tailings will yield to the cyanide treatment. Lavigne says from fifty-two assays the lowest return was \$6. It is the intention of the Michigan men to build a 40-stamp mill and cyanide plant. They will develop the vein by a tunnel, which will be driven 700 feet before the ore body is cut at a depth of 400 feet.

SILVER BOW COUNTY.

The Montana G. M. Co., near Butte, shipped last week to the United States assay office at Helena a \$2500 gold bar, the result of nine days' run on ore from the Sunday mine, which the company has under bond and lease, also having a lease on the Royal mill.

F. Farrell has taken up his option on the McQueen placer, a portion of the ground he recently acquired. It is understood he paid \$500,000, and his company, the Pittsburgh M. Co., will build a smelter.

A strike of copper is reported in the Lexington mine—a silver property—near Butte. It lies at the northern edge of the known copper belt.

The Standard says that with the exception of fifteen men the miners and other workmen employed at the Mountain Con. mine, owned by the Anaconda M. Co.,

Butte, were laid off last week for a month, as a result of a decision on the part of the company to retimber a portion of the shaft, which is 2200 feet deep. The men retained comprise the timbering crew and framers. The temporary suspension of operations at the mine throws 400 men out of work. The other mines of the company are to be kept in operation. The Green Mountain has also been closed down, but employs a few men.

NEVADA.

ELKO COUNTY.

At White Rock the Edgemont Co. is employing forty-five men and running its 20-stamp mill full capacity. Thirty men are employed in the Curlioux mine and ten stamps are dropping there. The Riddle mine has been bonded by Eastern men for \$100,000. There are few men working in the White Rock placers. As soon as there is sufficient water a large number of miners will be employed.

ESMERALDA COUNTY.

A group of mines at New Boston is reported sold for \$6000.

HUMBOLDT COUNTY.

The Lovelock Tribune reports a strike of horn silver in the Victor tunnel at Arabia district.

J. C. Hampton has sold to J. McClure the Gold Bullion mine at Unionville.

The mill at Mill City is running on ore from the Arizona mine at Dun Glen.

The Sheba Co. is to build a mill at Star City.

J. T. Kessel, superintendent of the Sheba mine, says the lower tunnel is in 275 feet. According to the survey, the main ledge should be tapped within 60 feet at a vertical depth of 700 feet. He expects to have the mill in operation February 1.

LINCOLN COUNTY.

Activity in mining along the Colorado river is increasing. A great deal of ore has been discovered lately.

The company owning the Rattan mine has built a mill at Hardyville for prospecting purposes; eight stamps are being operated. Later a 20-stamp mill will be built.

The El Dorado Canyon mine, idle for a number of years, is owned by an Eastern company that will shortly resume work.

At Searchlight the Duplex M. Co. is making some changes on its group of claims. The mill is on the Searchlight ground. The Ella, which lies over the hill to the east of the Searchlight, and between the Piute and I X L, will be connected with the mill by rail via the Fraction, from which point a spur will be run to the New Year's Gift. On the Ella is a shaft and an open cut, which exposes the lead for 60 feet. On the New Year's Gift a hoist is to be installed and sinking commenced. A crosscut is started from the 400-foot level in the Searchlight towards the Fraction and New Year's Gift. In the mill a centrifugal pump has been connected with the settling tank to raise the water back to the mill tanks. Manager Swindler has thirty-five men on the payroll.

Armstrong & Loop, owners of the Red Cloud mine near Goodsprings, report that from the main shaft drifts have been run north and south in ore. This property is the only known cinnabar mine in the Yellow Pine district.

Workmen are putting up a 32-foot gallow frame over the Good Hope shaft, at Searchlight. The hoisting machinery is on the ground. H. A. Perkins, manager of the New Era Co., is having development work done on his El Paso group. While the Quartette mine is closed down ore bins are being built in the gallow frame which will have a capacity of 400 tons. Twelve men are working on the millsite. P. Johnson is superintendent of construction.

LYON COUNTY.

The Douglass group of copper mines has been sold to a British Columbia company.

NYE COUNTY.

Last week an 8-foot vein was cut in the Colehan-Gold Mountain property, Tonopah, that went \$30 in gold, and on the Fraction an ore body was found in shaft No. 5, 400 feet west of the old strike. The rock contains wire silver.

The freighters of Tonopah have given notice that the rates for incoming freight will be increased from \$20 to \$25 per ton, as there is not sufficient ore being shipped out to supply outgoing loads for the teams.

The Tybo M. & R. Co., at Tybo, has closed down for the winter, pending the installment of a compressor and concentrating plant.

The main three-compartment shaft of the Mizpah at Butler is down 500 feet and one crosscut started to cut the ledge and another to tap the Valley View 700 feet distant. At the 490 level drifts have been run on the ledge several hundred feet either way. More development work has been done on the 300 level than in any

other part of the mine. The east drift is within 100 feet of the end claim and in ore. From the 300 station a crosscut has been run south 850 feet to connect with the Valley View, an adjoining claim.

The Aspen, San Sabe and Black Diamond claims, near Butler, were sold last week to T. J. Lamoureux of Oakland, Cal. The group lies 1 mile north from the central mines. The 25-foot shaft on the Aspen is to be enlarged and a hoisting plant put up.

The Tonopah Chief Co., east of the Mizpah Extension, near Butler, will sink their main double-compartment shaft to 200 feet and crosscut.

Recently while excavating at Butler wells, 4 miles from Butler, for the site of his mill, W. Osborn opened up a 2-foot ledge of quartz, and assays of the rock showed values in silver and gold, says the Miner.

H. Mead, who has been prospecting between Lone mountain and Silver Peak, reports locating five claims, one of which produces high-grade ore. No work has been done on any of the claims. The veins are 3 to 4 feet wide. Preparations are being made to sack and ship the ore.

WASHOE COUNTY.

At Olinghouse the three mills in camp are running steadily. The Belcher mine has a shaft down 75 feet, from which a drift is being run in ore. The Forlorn Hope has 300 feet of workings in ore. A stringer of rich ore is being followed.

The No. 2 has a body of ore on the surface which has been cut at 80 feet in the shaft. Twenty tons milled returned \$20 per ton. The shaft has been retimbered. Several hundred feet of work have been done on the No. 1. There are 100 tons of ore on the dump, which will be milled. At the Gold Center E. Olinghouse has 100 tons ready for the mill.

The Cabin mine, owned by W. C. Williams, is in operation. At the Cabin No. 2 the tunnels are being strengthened, the mine retimbered and the track relaid with iron rails. The Hutchinson has an incline 75 feet in ore. The Jumper is stopping ore from the 150 level.

Another strike is reported at the Wedekind mines, near Reno.

WHITE PINE COUNTY.

Contractors will drift 500 feet on the 700 level of the Star mine, near Cherry creek.

Work has been resumed on the Morris mine of the Groux-Snedaker Syndicate, near Ely. The ore being broken in the bottom of the Groux shaft contains copper sulphides.

The 54-foot gallow frame on the collar of the Copper Flat shaft, at Ely, and the hoist will be in operation next week. The new shaft, 775 feet distant from the old one, is already in copper ore.

The Rocco-Homestake Co., whose mines are at Hamilton, is reported to have opened a large body of carbonate ore, the best strike ever made by the company. The ore will run 36.5 silver and 71.5 lead. The thirteenth dividend of the company has been paid, the company having paid \$69,500 in dividends to date.

NEW MEXICO.

DONA ANA COUNTY.

A new rock crusher will be put in at the Modoc mine, near Las Cruces.

COLFAX COUNTY.

Drilling for oil on the McKown ranch, near Raton, is begun by the New Mexico Oil & Gas Co.

RIO ARriba COUNTY.

P. Sanchez was killed last week at Glenwoody camp, 3 miles from Rinconada, by a shot which had missed fire. He picked out some of the tamping and put in new powder and a cap. He tamped it too hard and the shot exploded, killing him.

OREGON.

BAKER COUNTY.

The raise from the 200 level of the Golconda, near Sumpter, opened 2 feet of ore in the east vein that runs \$100 a ton.

N. Gelder of New York has an option on the Buckeye group of mining claims on the Elkhorn divide.

The North Pole M. Co., near Sumpter, has completed the tramway from tunnel No. 4 to No. 1, on the northern terminus of the main aerial tram. The new line is 2500 feet long and makes a lift of 1190 feet and passes the mouths of tunnels No. 2 and 3. Buckets on the main tram carry 250 pounds and hang 100 feet apart. The new tram is claimed to have an equal capacity.

President Wright says a 10-foot ore body has been opened in the third vein of the Bluebird property, near Sumpter. It is intended to drive 250 feet and raise to the top. This work is being done by hand, but as soon as the development plant is installed machine drills will be used.

The Big Horn group in the Cracker Creek and Red Creek districts is reported

sold to the Killen, Warner, Stewart Co. Four claims are in the property, one crossing the North Pole divide and the others in the Rock Creek basin, all on the same fissure. This is the third property the firm has acquired in the Cracker district. Two others, the Cracker Eagle and the Cracker Summit, are being developed.

At the Golconda, near Sumpter, ore assaying \$100 is being sacked on the 100-foot level. The same shoot has been cut on the 300 foot level, but the width is not yet determined. The main tunnel is being driven toward the point of outcrop, following a vein 7 feet wide of milling quartz. Last week connection by upraise was completed between levels two and one. Connections were recently made between levels three and two and from the first level to the surface. Ladders have been placed in these upraises, that they may be used as exits.

W. H. Mead of Spokane, Wash., has taken up his bond on the Gladstone group of five claims near Sumpter. Mead and associates are organized as the Interstate M. Co.

The Big Four G. M. Co. has incorporated at Baker City to operate in the Blue River district; T. N. and J. E. Segar and C. A. Hardy.

The Daines M. & M. Co. of Spokane, Wash., owners of the Belcher group, in the Greenhorn district, near Baker City, has bought the Golden Gate, adjoining the Belcher, for \$10,000. A mill is to be erected in the spring to handle the ores of both properties.

A company has been organized in Baker City to be known as the Golden Star Gold Mines Co., W. E. Grace, Baker City, president. The Golden Star group of three claims on Olive creek in the Greenhorn district with a mill site, water rights and timber, has 600 feet of work. They will sink a double-compartment shaft. A mill will be built.

At the Bonanza mine, near Sumpter, it is reported the vein has been opened on the 800 level. The mill will resume next month.

E. Butze, of Baker City, superintendent of the Northwest Coal & Iron Co.'s gold mine near Sumpter, says a vein has been cut in the tunnel, being driven on the Colorado, and the Gould & Curry, which they own, and that the ore carries a telluride of gold. This tunnel, in about 140 feet, is being driven by contract, with two shifts.

The Psyche 20-stamp mill in the Greenhorn district is in operation. J. T. Eden is superintendent. In the vicinity the Phoenix mill, with ten stamps and Bryan roller mill will be in operation next month.

At the California mine, near Sumpter, construction work is going ahead. The steel cable for the 2800-foot Hallidie tramway is being strung on the towers. At the mill the third section is up and the superstructure will be enclosed next week. This mill will be a concentrator with fifty tons daily capacity. All of the timbers and lumber used were cut at the company's sawmill.

At the Oregon Monarch, near Sumpter, the crosscut on the adit level has cut five ledges, two of them the past month. The first of these is from 2 to 4 feet in width, and dips in the opposite direction to the outcropping veins. The ledge was cut 375 feet from the mouth of the tunnel. The tunnel is in 400 feet, with a vertical depth of 250 feet. The air compressor at the Red Boy supplies the air to the drills.

GRANT COUNTY.

A strike is reported in the Strassburg, near Alamo, in which W. H. Remington and W. S. McCormick, of Salt Lake City, Utah, are owners. There are three tunnels on the property; No. 1 is in 700 feet; No. 2, 1000 feet; and No. 3, 500 feet. No. 3 tunnel is being driven on contact, and the strike was made 200 feet beneath old workings. The lead is here 20 feet wide. A 40-stamp mill is proposed. The Strassburg group consists of six patented claims.

On the Alamo, near Alamo, six men are extending the lower tunnel, which is in 900 feet. They expect to cut the main lead next week. W. H. Chambers is pushing development on the Big Producer group of eleven claims. On the Humpback of the Van Anda group, adjoining the Strassburg, three men are at work. The Oregon & Colorado M. Co., owning the Quebec group, have six men developing. The 10-stamp mill will resume.

JACKSON COUNTY.

The Western Star M. Co., operating near Medford, is running a tunnel on the ledge and has cut a body of quartz that carries high values in gold. Six men are working on the Whale tunnel. The number will be increased and a crosscut tunnel begun 200 feet below the workings. The ledge is 12 feet wide where the pay rock is found. Dr. Damourette is the president of the company.

The Record says work is being done on

the placers of Coleman creek, near Ashland. D. B. Reame has resumed work on his ground.

J. Layton, owner of the Layton placer mine in the Applegate country, has leased his water privileges for the season to Watson & Durham of Portland.

JOSEPHINE COUNTY.

The Greenback mine of the Grave Creek district, near Leland, has its 20-stamp mill in operation. A 15-stamp mill was reduced to five stamps, which will be used for sampling. The new mill was built farther down Greenback mountain. The crew has been increased, drills added, a hoist put in, larger engines and boilers installed and electric lighting and cyanide plants added. The mine is opened to a depth of 800 feet.

A 4-stamp mill is being set up at the Fremer and Palmer mine on Mount Reuben, near Grant's Pass.—The Gold Bug mine, on Mount Reuben, has closed for repairs.

The New York & Western M. Co. has bought the Oregon Belle mine, near Grant's Pass, for \$30,000. The Oregon Belle, in depth, shows a body of ore carrying free gold and sulphurets. A Huntington mill on the mine has been operated by former owners. The new owners will develop the property. They will put in a large mill as soon as they have the mine sufficiently opened.

SOUTH DAKOTA.

LAWRENCE COUNTY.

A cyanide plant of 300 tons daily capacity is being operated by the Spearfish Co. at Ragged Top, 8 miles south of Deadwood. The cleanups amount to \$25,000 a month. The ore is lime shale in flat blankets. The company owns thirty acres.

The Alder Creek M. Co. is producing \$7250 in gold monthly, at the cyanide plant on Yellow creek, a mile and a half south of Lead. The ore is in cambrian quartzite and porphyry, with a value of \$4 a ton. The plant has a capacity of sixty tons daily. The crushing machinery will handle 150 tons and the company is planning to add more tanks in the spring.

On the same creek the Wasp No. 2 M. Co. is running a 100-ton cyanide mill and cleaning up \$9000 a month. The average value of ore per ton is less than \$3. Everything in the mine is run through the mill that carries over \$1 a ton. Improvements have been made by driving a tunnel through the hill, shortening the haul. A new dryer has been installed.

TEXAS.

JEFFERSON COUNTY.

It is reported that the Standard Oil Co. has obtained control of the Beaumont oil fields and also has been buying every independent field around Beaumont. Hundreds of wells have been sunk.

UTAH.

BEAVER COUNTY.

The new lead furnace for the Lewis smelter at Milford has arrived. The smelter will be ready to blow in by the latter part of January.

BOX ELDER COUNTY.

S. Simon, president Sunrise mine, near Park Valley, says the tunnel is in 450 feet. A stringer of ore was struck recently which showed 3 feet of values. The management thought this was not the main vein and continued this tunnel and are now breaking into the lead. The Sunrise property adjoins the Century.

A strike is reported in the Bluebird, on Dom creek, Park Valley. Ore was encountered in the main tunnel at a depth of 175 feet, carrying values in gold, silver and copper.

Four feet of gold ore and enough water to run five additional stamps have been struck in the Century mine at Park valley. Manager P. W. Madsen says he shipped a \$2300 bar of gold this week and a car of concentrates running \$75. The bar of bullion represents ten days' run at the mill.

Articles incorporating the Osborne M. and M. Co., with Salt Lake as its principal place of business, have been filed; P. W. Madsen, J. A. Jennings, E. W. Madsen, J. H. Cline, C. S. Price. The company will develop the Osborne claims Nos. 1, 2, 3, 4, 5, 6, 7 and 8, in the Park Valley mining district.

IRON COUNTY.

Manager G. Smith, of the Margaret property at Stateline, says a strike has been made in the west drift from the 220 level of the new double-compartment shaft. To the east bodies of ore have been previously opened and the drift west was started with the purpose of tapping a shoot believed to exist on that side. At a distance of 150 feet from the shaft the ore began to make its appearance.

C. A. Short, manager of the recently incorporated Jennie Co.'s property in the Stateline district, has men at work. He

intends to put up a mill during the coming season.

JUAB COUNTY.

J. Eustice of the Emma Jane group, west of Eureka, says the shaft is down 120 feet on the ledge and shows rock carrying values in gold, silver and copper.

A train composed of eighteen cars of Grand Central ore was shipped from Mammoth Dec. 27, which was the largest shipment ever made from the mine in any one day.

The Centennial Eureka tram at Tintic has been overhauled to carry the increased load, and the mine will send out 200 tons of ore a day to the new United States smelter in Salt Lake valley. The tram was first built to care for half that amount, but was run at a 200-ton speed. This being dangerous, the braking arrangements were remodeled.

The Grand Central, at Tintic, it is reported, will be able to increase shipments of high-grade with the new year.—The Star Con. is working a good body of ore.

The Laclede mine, T. Welr manager, is shipping. The breast shows 4 feet of ore, carrying values in silver, copper and gold.

At the Ajax two donkey hoists have been put in the winze in the north drift on the 1000 level and a hoist in the south drift, which is 275 feet from the Lower Mammoth line.

Two cars of ore from the Carls Co.'s property at Tintic were disposed of recently for \$4900. One car assayed \$168 gold and ten ounces silver while the other was copper ore running 28%.

A body of ore has been opened up in the Utah mine at Fish Springs. This ore assays 25% lead and 500 ounces silver. This is on the third level. On the fourth and sixth other bodies have been encountered. A 50-gallon per minute pump is being put in and sinking will resume.

SALT LAKE COUNTY.

Last week the Mystic Shrine's new tunnel at Bingham, which is following a fissure and has been driven 100 feet in the past two months, broke into a body of copper-bearing ore. Manager Young says the main tunnel has been run 500 feet and will be pushed to the bedded vein.

Manager F. Cook, of the Columbia C. M. Co. at Bingham, has resumed driving the Cunningham tunnel, which is to be extended 400 feet to cut the Alice vein 1025 feet from tunnel mouth. The company's shipments during 1902 included 350,000 pounds of copper, as compared with 115,000 pounds shipped in 1901, when the property was worked by leasers. A 75-ton lot of ore sent out last week brings the Columbia's December shipments to 100 tons.

Assays made of ore from the Peruvian of Little Cottonwood is reported by Manager Clays to contain 40% lead and eighty ounces in silver, besides gold and copper.

P. W. Ober, leasing the Hazel, adjoining Montezuma, near Bingham, has sunk an incline 15 feet on a vein carrying carbonate of lead and silver. A winze from the Snake (upper) tunnel of the Silver Hill claim of the New Red Wing group has followed an ore streak that has widened to 5 feet. One foot of the ore is galena, carrying 30% lead—the balance being of milling quality.

The Peruvian M. Co. reports a strike in its property in Little Cottonwood district. In the lower tunnel, 500 feet below the surface, a 6-foot vein has been opened up. Of this a foot is galena of shipping grade, while the rest contains milling values. Drifting on the vein is now in progress. Average samples assayed—lead, 20%; copper, 1.5%; silver, 38.9 ounces; gold, \$3.60. The Peruvian property is in Peruvian gulch off Little Cottonwood canyon below Alta.

At Bingham the Utah Con. (Highland Boy) M. Co.'s output of copper bullion last week was 352,800 pounds, from 3500 tons of ore, which is 3000 pounds more than for any previous week.

SUMMIT COUNTY.

Near Park City the Bogan shaft, now the Silver King Con., which is 600 feet deep, is to be enlarged to three compartments and will be sunk an additional 600 feet. Superintendent Keetley will install an air compressor and pumps.

The Anchor mill closed last week for repairs. Its capacity will be doubled. Superintendent M. C. Harrington of the Keystone, near Park City, reports the blacksmith shop, hoist and other buildings completed and the hoist in operation. The shaft is down 70 feet and sinking to the 600-foot mark.

The Record says an 18-inch strike of ore has been made in the Lone Pine, in the Snake Creek district, in the shaft, 85 feet down.

Ore carrying 25% copper is reported struck in the Great Western G. & C. Co.'s mines, in the Big Cottonwood district, which join those of the Daly-Judge and are over the divide from Park City.

WASHINGTON.

FERRY COUNTY.

The owners of the Malachite mine, near Keller, recently struck the ledge in No. 3 tunnel. Their No. 4 tunnel is in 307 feet, and they expect to reach the ledge in 22 feet.—The Iconoclast is temporarily closed down, pending the reorganization of the company.

The owners of placer claims on Mary Ann creek are getting in machinery as a preparation for active work next season. A reservoir has been built near the head of the creek by several of the claim owners. A pumping plant has been installed, by means of which water can be taken from a lake that is several feet lower than the placer grounds.

OKANOGAN COUNTY.

On Copper Mountain, near Bolster, the Mountain G. M. Co. has a tunnel in 800 feet, proving its property at a depth of nearly 400 feet.

WYOMING.

CARBON COUNTY.

It is reported the Copper Belt M. Co. has sold its property to C. R. Fishback and associates for \$250,000. This property consists of twelve claims in the Battle Lake district, adjoining the town of Dillon. These claims are patented and are the western extension of the Ferris-Haggerty and Osceola properties.

The breast of the Big Creek tunnel, in 850 feet, is in ore carrying galena, silver and copper. The same character of ore was found in the shaft, where at a depth of 140 feet the ore is 24 feet wide. The depth gained in the tunnel is 500 feet.

A company has been formed to develop Golden Edge claims, 3 miles southwest of Battle, in Baby Lake canyon.

Another strike of copper ore is reported in the new shaft on the Verde property south of Battle, showing a body of sulphides. At a depth of 70 feet the shaft has cut the foot wall. The crosscut in the Mount Zirkel from the 225-foot level has been run 25 feet, cutting the foot wall 14 feet from the shaft.

The buildings at the upper tunnel of the Doane Rambler mine, near Rambler, were destroyed by fire last week, including tunnel house, ore house, etc. The boilers and engine are not seriously damaged, though the air compressor is thought to be. The men in the workings got out safely. A ton of powder was lost also. The Battle Lake Tunnel site M. Co., owners of the mine, were having new machinery and buildings put up.

FREMONT COUNTY.

A. G. Paddock of South Pass sold his Rose mine to a company headed by A. Kendall of Rock Springs for \$50,000. The first payment of \$10,000 has been made.

FOREIGN.

BRITISH COLUMBIA.

The Annie vein of the Le Roi No. 2 at Rossland, which faulted at the 300-foot level, has again been located.

The minority interest in the Oro Denoro is reported bonded to S. Curtis and A. McNish of Rossland.

The Prospector says there have been during the past year 150 men working the paying placer mines on Wild Horse creek, near Fort Steele. During the season several tunnels were run to prospect the gravel overlying what is supposed to be the old channel of Wild Horse creek, and attempts were made to bottom the channel of the main creek by means of shafts, but were abandoned on account of water.

—The Nip and Tuck, owned by D. Griffith, is leased to a Chinese company. The gold obtained is coarse. The bedrock is hard and smooth, without crevices. The company are cutting a flume in bedrock, which will be completed by spring.—R. Dore, at the Cariboo, is running a tunnel to tap a channel on the west side of the creek. From the results obtained by a Chinese company on the east side of the creek it is supposed there is another channel parallel with the main creek.—During the years that placer mining has been conducted on Wild Horse the creek has been filled with tailings, which have been worked by a Chinese company by means of a bedrock flume.

Considerable work is being done on Boulder creek, near Atlin, this winter, in view of the weather conditions, says the Claim. In some cases drifts are being run in the creek bed, keeping in the pay where the summer's work ended. In others the pay is being followed in and under the benches. Timbering has to be done in every case. All the operators are sluicing the dirt as they take it out, and by the arrangements for sluicing they are encountering very little trouble from cold weather.—L. Yerke and partner are working on the company's ground, and near the intake Johnson and son are running a drift into the right-hand bench.—T. Rayl et al are drifting in the creek

bed.—Burgin, Hetland & Bartim, above Rayl, are following the pay into the bench by drift.—On the Weston property, bought by Stevens, Currie & Benton, a drift is being run into the right-hand bench in pay.—Norton brothers are working with four men on the Victoria group.—Pavey, Anderson, Deal & McNaughton are drifting on the Anderson property.—Symons & Pillar, on the former's ground, are drifting from the creek into the bench.

The past season's work at Lytton has proved that the Fraser river will pay to dredge. Twenty-eight ounces have been taken out in one day. Now dredges will be put in. Mr. White, chairman of the directors, is in charge of the work.

It is reported the Morning Star, a gold quartz property near Fairview will resume. The Morning Star and the Black Diamond are owned by S. Mangott and P. McEachern, of Fairview. They will sink another 100 feet on the Morning Star.

T. Conley and associates have leased the Canadian King mine at Erie. An incline shaft has been sunk to 288 feet and a total of 600 feet of development work done.

The tonnage for the past year of the Slocan and Slocan City mining divisions will amount to 26,000 tons, being about the same as for 1901. One-third of this was contributed from the dry ore mines. There are 300 men working in the vicinity of Sandon.

The Bosun, Payne, Wakefield and Hewett are making test shipments of zinc ore to Iola, Kan., and the Slocan Star and Ivanhoe propose doing the same. During the past year the largest shippers were the Arlington 3460 tons, American Boy 1092, Payne 1802, Whitewater 2962, Enterprise 1960, Rambler-Cariboo 4123, Ruth 825, Bosun 1190, Monitor 1136.

The Ruth, Whitewater, Last Chance and Noble Five are now closed. A few men are doing development work, getting out ore to pay running expenses. In McGuigan basin the Rambler-Cariboo is working forty men, having out its force one-half, and is shipping eighty tons per month. There is not enough water during winter to run the mill.

The Antoine is shipping seventy-five tons per month and working ten men. The Red Fox and the Washington have twelve men each and are shipping forty tons per month. The Silver Gleaner, near Bear lake, is another shipper. It has a showing of sulphurets and carbonate ore. The returns from one car gave \$3000. The Hope, adjoining the Ruth, is doing development and shipping two cars of carbonate per month. The Ivanhoe, owned by the Minnesota Silver Co., has been developing with twenty men, running the mill occasionally, and is making a zinc product. It has on hand 300 tons, but because of present prices is not shipping. The American Boy is shipping 100 tons per month and employing twenty men. It is shipping its ore over the Noble Five tramway and then out over the K. & S. railway. The Sunset, above Cody, has shipped 250 tons of ore since the rawhiding season of last winter. The management has decided to cease shipping and do only development work during the winter. They propose to build an aerial tramway in the spring.

G. Hughes is reported to have sold his fourth interest in the Idaho mines, near Sandon, for \$75,000 to the Scottish-Colonial Goldfields Co.

The Goldfinch claim, near Greenwood, is bonded to C. M. Fassett of Spokane, who has let a contract to sink 100 feet. Adjoining the Goldfinch are the Lancashire fraction and E. Pluribus Unum claims, under bond to parties represented by D. W. McVicar of Nelson. A prospect shaft on the former has been cleaned out and sinking resumed.

The stamp mill at the Wilcox mine, near Ymir, is in operation, reports Superintendent White.

The returns from the Arlington mine, near Erie, for November show 106 tons of ore and concentrates gave a return of \$4705.72. In addition a royalty of \$463.21 was obtained from sixty-three tons shipped by lease holders. The expenses of mining and developing through the same period were \$3317.41.

C. H. Wolf, a director of the Waterloo mine, in Camp McKinney, has arranged for a new hoist capable of working 600 feet. He says: "Since starting work in October we have opened a body of ore on the 150 level 4 feet wide. Average values from this level were \$81.86 for the first half of the drift and \$90.95 for the last half. The dump averages \$59.12. Two separate lots stored in the bins at the mill average \$34.31 and \$21.08. We will soon begin to sink the shaft another 100 feet and open the 250 level."

The Mines Exchange of Nelson reports that E. Cole of Portland, Or., has an option on a one-third interest in the Spotted Horse group near Ymir. The Standard Development Syndicate has

been formed to operate the Hunter V. mine, between Porcupine and Hidden creeks, consisting of the Hunter V. and Double Standard claims. The surface formation of the former claim consists almost entirely of calcite, nearly all of which carries a small value. Interspersed in it are pocket ore shoots of gold-bearing gneiss. Two carloads of ore were rawhided out last winter, and were reported to have returned a value of about \$26 per ton.

The Payne mine management is working two shifts getting out zinc ore for shipment to the Lanyon smelter of Iola, Kansas.

The Morning Star group, near Fairview, is sold to E. L. Simpson, J. Hogan and T. A. Beall of New York, for \$25,000.

At the Payne seventy men are working at the mine and two shifts are employed at the mill. The concentrator is milling zinc exclusively, sending out two cars daily, besides a weekly shipment of twenty tons silver and lead concentrates.

The Lucky Jim is leased to Goldsmith & Jefferies of Sandon.

In the Lardeau mining district the Northwestern Development Syndicate expects to have its small mill ready for operation by Feb. 1st. The aerial tramway to the Goldfinch claim has been completed.

The final payment on the Cholla group is made by the Imperial Syndicate to A. F. Rosenberger.

Revelstoke men have bought the Silver Dollar group, three claims and two fractions, about 200 acres.

The third payment on the Eva mine was made on the 10th inst. to A. F. Rosenberger by the Calumet & British Columbia Gold Mines, Ltd., \$10,000, a total of \$25,000 paid to date. The group is on Lexington mountain, 1½ mile from the town of Camborne, at the junction of Poole and Fish creeks. The formation in the vicinity is talcose and micaceous schist, at intervals resembling sandstone or quartzite. There are six main tunnels on the property, from which have been run numerous drifts. There are a number of smaller cuts and surface workings. The total length of the tunnel workings amounts to over 2000 feet. The management is figuring on a stamp mill.

C. W. Milne, chairman of the Rossland-Kootenay Co., says the Victory-Triumph mine on Sophie mountain will be reopened. The principal workings on the Victory-Triumph consists of a tunnel, giving an average of 250 feet of backs. This tunnel runs for 350 feet through an ore shoot, carrying gold-silver-copper values. Manager Thompson estimates that there are 20,000 tons of concentrating ore in sight. He will recommend to the company that a "high speed" gravitation stamp mill be installed—the concentrate shipped to the reduction works. The ore will concentrate six to one."

Stopping has begun at the Kootenay mine and shipping started, says C. W. Milne, of the Rossland-Kootenay Co. These shipments will be temporary. The ore will be sent to the Trail smelter, where tests will be made. This company is considering the building of a smelter.

It is reported that the Abe Lincoln mine on Deer Park mountain, near Rossland, will resume. Copper ore of good quality has been found on the Abe Lincoln, but the veins thus far have been stringers.

The Paystreak says seven men will be kept at work on the Sunset, near Sandon, all winter doing development. Ore has been taken out ready for shipment and reserves blocked out, but only enough rawhiding will be done to keep the trail open. J. Wolverton has bought A. Erickson's interest in the C. O. D. claim on Bear lake and development work is being done.

A contract for sinking a shaft 100 feet on the Gold Finch claim, near Greenwood, recently bonded by C. M. Fassett of Spokane, has been let to J. H. Griffin and P. Steffen.

At the Montreal & Boston C. Co.'s smelter at Boundary Falls the iron work of the new furnace is in place and the brickwork is being done. Superintendent Goodell says the second furnace will be blown in next week.

A snowslide struck the bunkhouse of the Molly Gibson mine, 10 miles from Lake Kootenai, Christmas night, wrecking the building, and it is reported ten men were killed.

C. M. Eyr has succeeded to the management of the Bullion Extraction Works at Silica, where the War Eagle and Center Star companies are experimenting with the concentration system they have evolved. The experiments are reported to be proceeding satisfactorily. Several additional agitating tanks are to be installed.

The Rossland Miner says New York men, represented by W. W. Hageman, have a two years' working bond on the Hungry Man property on Rover creek opposite Slocan Crossing. Machinery for

development ahead will be put in. The property has a vein opened up at several points by shafts and drifts. The ore is pyritic, carrying gold-copper values.

It is reported the Cobbledick dredge has closed a successful season on the Fraser river. This is the first to pay in British Columbia. The company proposes to increase operations next season. In Harper's camp, Cariboo, where hydraulic plants are operating, the expense is so heavy that although the ground yields \$1 per cubic yard it is too expensive to yield good profits. Manager Ward says the proposition is now being considered of using dredges on these properties. Last season Mr. Ward took out \$3000 a month, which little more than pays expenses.

KLONDIKE.

The geyser on fraction No. 3 on El Dorado creek has done much damage. The geyser, which broke out early in December, and which the Government succeeded in capping, has broken out anew and is sending a great volume of water all over the country. The glacier which has been formed from the geyser extends over an area of 3 miles and is increasing.

MEXICO.

CHIHUAHUA.

The La Luz G. M. Co. has begun operations at Maguarichic. A contract for a 200-foot tunnel has been let to connect with the old workings known as the San Francisco mine, and will be run on the San Jose vein. Men are taking out ore on the El Salto vein of the La Luz property. A contract for a tunnel to connect with this work will be let. On the adjoining property, the Sociedad y Anexas, a shaft has been sunk 185 feet on the La Vena vein. Three levels have been run on this vein from 20 to 100 feet each, and a crosscut from the 150-foot level has cut the San Jose vein, showing 2 feet of ore which assays \$200.

The concession granted to F. Arellano, M. Tamborrel and J. Urias for the establishment of two metallurgical works, one in Parral and the other in Jimenez, has been approved by the Mexican Congress. H. J. Clifford, manager of the Dragoon M. Co., says he will resume work on the Columbia mine at Terrazas next week.

At Terrazas the development work in the Shamrock has opened up a 2-foot vein of ore, which later widened to 5 feet.

On the Guadalupe, at a depth of 60 feet, F. McDonald says he found a flat vein that contains the same grade of ore as that found at greater depth in the old workings.

Dale Bros. & McDonald are working day and night shifts on the Wisconsin, adjoining the American, recently sold to Boston men.

SONORA.

The Cochise & Sonora M. Co., owning 500 pertenencias 25 miles southwest of Cos, the terminus of the Nacozari Railroad, has one shaft down 300 feet and another 200 feet.

The Mexican Hydraulic M. Co. is incorporated in Tombstone, Arizona, to work 20,000 pertenencias of placer ground in the district of Altar. The fields are known as the Cienega and Bonanza placers.

The Anglo-American G. & C. Co. is exploiting a gold-copper property of 200 pertenencias in the San Domingo mountains, south of Cananea, between Bacuachi and Baconoché. Four tunnels have been run in on the vein and show ore containing iron, copper, gold, carbonate of lead and zinc. The ore is said to run \$16 in gold and 6% copper. A three-compartment shaft is being sunk.

The Grand Central at Minas Prietas is prospecting several of its properties with a well-boring outfit. Each bucketful of dirt is assayed as the work progresses.

The report of Consul-General Barlow states that Sonora has the greatest amount of American capital invested in mining of any State in the Republic of Mexico—\$27,800,000. Chihuahua comes next with \$21,000,000. Coahuila shows the greatest total of American investments—\$48,700,000—of which \$37,800,000 are credited to the Mexican International Railway. Sonora comes next with \$37,500,000, of which, as stated above, more than \$27,000,000 are in mining enterprises.

The Cananea Co. has decreased its working force by 400. The company intends building 25 miles of railroad and a \$150,000 water system that will bring water from the head of the Sonora river to Cananea.

The Ruby G. & C. Co. is developing a property near Batamote, 40 miles southwest from Ortiz. G. W. Crowe is general manager. Sixty men employed. A good showing of ore is reported.

A Texas company, with B. Gibbs of Dallas as manager, has denounced 1200 pertenencias of the placer 22 miles from Magdalena, and 3 miles from the Sonora Railroad. The placer has 18 feet of gravel and is to be handled by a dry process.

Personal.

J. STEWART is superintendent Leland mine, Mohave county, Ariz.

ALGERNON DEL MAR of Los Angeles, Cal., is in San Francisco, Cal.

L. I. BLAKE of Lawrence, Kansas, has returned there from Denver, Colo.

E. B. RANDOLPH is superintendent the Italian mine in Lemhi county, Idaho.

BEN STANLEY REVETT has returned from San Francisco, Cal., to Denver, Colo.

J. H. PORTER, manager Fairview mine, Minersville, Cal., is in San Francisco, Cal.

J. S. EGGINGTON is superintendent of the Del Rey Oil Co., near Bakersfield, Cal.

J. F. PARKS, superintendent Kennedy mine, Jackson, Cal., is in San Francisco, Cal.

J. JOSEPH of San Francisco, Cal., mine owner of Tonopah, has gone to Tonopah, Nev.

W. THOMPSON, general manager of the Rossland-Kootenay Co., has gone to London, Eng.

E. L. WHITE of Victor, Colo., is appointed Stato Commissioner of Mines for Colorado.

SUPERINTENDENT J. BRAY of the New York and Nevada C. Co. at Ely, Nev., is in New York.

W. J. BELCHER, owner of the White Bear mine, near Downieville, Cal., is in Oakland, Cal.

W. S. EBERMAN, of the Oregon S. & R. Co., Sumpter, Or., has returned from Seattle, Wash.

J. H. SANBORN, of Denver, Colo., representing the Leyner Drill Co., is in San Francisco, Cal.

C. A. BUTTERS, E. M., is examining mining properties at Candelaria, Esmeralda Co., Nevada.

M. SAVAGE is superintendent of the Deep Canyon mine, near Last Chance, Placer county, Cal.

W. P. KETCHAM, superintendent Copper Bell mines, Clinton, Mont., has gone to Milwaukee, Wis.

MANAGER B. T. LLOYD of the Copper Mountain has returned to Salt Lake City, Utah, from the East.

S. E. RIGG, superintendent the McAlpin mine, near Groveland, Cal., has gone to Seattle, Wash.

MANAGER RADDATZ, the Honoring mine at Stockton, Utah, has returned from Salt Lake, Utah.

A. P. MALLON of the Anaconda C. M. Co. assay department at Anaconda, Mont., is in San Francisco, Cal.

D. R. WILLIAMS, superintendent of the Carisa mine, has returned to Tintic, Utah, from Salt Lake City, Utah.

T. GOODWIN is general manager the Republic & R. Co. smelters, at Salida, Colo., and at Leadville, Colo.

M. D. GAYLORD, superintendent American and Helen Rae mines, has returned to Nogal, N. M., from the East.

BERNARD MACDONALD has returned to Spokane, Wash., from Murray, Idaho, where he has mining interests.

E. W. MUELLER, manager the Oregon S. & R. Co. plant at Sumpter, Or., is in St. Joseph, Missouri, on a visit.

H. THORP, superintendent Hathaway placers, on Grouse creek, in Marshall Lake district, Idaho, is in Denver, Colo.

G. B. HALLORAN, superintendent Hollister interests in Thunder Mt. and Big Creek districts, Idaho, is in Boise, Idaho.

G. V. HOPKINS has resigned the management of the Bullion Extraction Works at Silica, B. C., being succeeded by C. M. Eyr.

THOS. RICKARD, of the firm of Harron, Rickard & McCone, has returned to San Francisco, Cal., from a visit to New York City.

R. WHINNERAH has resigned as superintendent of the Humphrey T. & M. Co.'s mill at Creede, Colo., and is in Denver, Colo.

J. KEEGAN has resigned the position of superintendent of the Mountain Con. mine of the Anaconda M. Co., Anaconda, Mont.

W. C. WALLER, E. E., of San Francisco, Cal., has gone to Tonopah, Nev., to look after the electric lighting installation there.

H. M. CROWTHER of the Blue Con. mine in Beaver county, Utah, has returned to Salt Lake City, Utah, from Arizona.

G. H. ROBINSON, consulting engineer for the Montana Ore Purchasing Co., Butte, Montana, has gone to New York on business connected with the Heinze interests.

G. K. KIMBALL, JR., manager the Old Town Con. M. Co. of Russell gulch, Gil-

pin county, Colo., has returned there from Pittsburgh, Pa.

H. A. GEISENDORFER has returned to California from Sumatra, and has gone to the Golden Eagle mine at Hayden Hill, Cal., as foreman.

W. H. MCCLINTOCK of the San Pedro Mines Co., Tuolumne county, Cal., has returned to San Francisco, Cal., from Phoenix, Arizona.

W. L. COBB, of the Wright-Gilman Co., San Francisco, Cal., has returned from Sonora, Mexico, where he has been examining mining properties.

U. B. CURTIS has resigned as manager Tonopah Fraction M. Co. at Butler, Nev., to devote his time to other properties in Tonopah in which he is interested.

J. QUINN, former superintendent the Sampson mine, Bingham, Utah, goes to Shasta county, Cal., to have charge of the Western Exploration Co.'s Gold Peak mines.

JOHN K. MACKENZIE of Dickman, Mackenzie & Potter, mining engineers of Chicago, has returned from Mexico. Mr. Mackenzie will be at Gilt Edge, Montana, next week.

R. N. DICKMAN of Dickman, Mackenzie & Potter of Chicago has returned to Chicago from Europe, where he has been for nine months examining mining properties of an American company.

C. H. LINDLEY, of San Francisco, Cal., has returned home from Washington, D. C., where he has argued the case of the Kennedy vs. Argonaut M. Co. before the United States Supreme Court.

W. F. DETERT, president the Argonaut G. M. Co., Jackson, Cal., has returned from Washington, D. C., where he attended the re-argument of the Argonaut-Kennedy case before the Supreme Court of the United States.

GEORGE J. ROCKWELL, who for many years has been connected with the Allis-Chalmers Co. in Chicago as metallurgist and salesman, has been transferred to Denver, Colo., to be associated with Robert J. Cory, manager of their office in that city.

Obituary.

J. W. YOCUM, president of the Black Swan M. & M. Co., near Salina, Boulder county, Colo., died in Reading, Pa., Dec. 23, 1902.

PROF. P. H. VANDIEST, the metallurgist and geologist, died of heart failure at the home of his son in San Luis, Colo., on Christmas day. Mr. Van Diest was born in Edam, Holland, and came to Colorado in 1872. For a time he held the chair of metallurgy in the State School of Mines. He was the discoverer of a new telluride in this State which bears his name, diestite. In addition to the son he leaves four daughters.

Books Received.

"The How and Why of Electricity," by Charles Tripler Child, published by the Electrical Review Publishing Co. of New York, N. Y., is an attractive and instructive little volume for the non-technical reader. It contains 127 pages, and numerous drawings. While not pretending to tell what electricity is, it does tell of its properties, how generated, handled, controlled, measured and set to work. Price \$1.

"A Text Book of Quantitative Chemical Analysis" is the title of a 600-page, octavo, volume, by Frank Julian. It is a thorough dissertation of the subject, with many illustrations of appliances and methods. It is intended for the aid of students having a fair acquaintance with the elements of general chemistry. In the various chapters of the work the general principles of the art are described. Directions are given in detail. In part 3 is considered the analytical behavior of a number of articles of commercial importance. More prominence than is usual in such treatises on quantitative analysis has been accorded the principles underlying the methods of analysis. Price, \$6 net. The Ramsey Pub. Co., St. Paul, Minn.

Catalogues Received.

"Wire Rope Tramways" is the title to the latest publication of A. Leschen & Sons, of St. Louis, Mo. The booklet is handsomely illustrated, showing the operation of their rope tramways under many conditions. These tramways are automatic—of the double rope type, reducing the labor of handling materials to the minimum. The buckets are of several patterns, but all are so arranged that they cannot tip over of themselves, though requiring no locking up to keep upright. The book will prove of interest to all who have difficult problems in transportation in mountainous regions. Sent on application.

Commercial Paragraphs.

WADE & WADE now occupy their new assaying establishment 318 E. First St., Los Angeles, Cal., a building erected by themselves on their own ground with special reference to the requirements of their business.

THE Chicago House Wrecking Co. of Chicago will erect an addition to their shops of 135x435 feet. This company do considerable business in second-hand machinery, buying and selling in every part of the world. They report that their business with mines has increased greatly of late.

THE Smooth-On Manufacturing Co. writes that while a Smooth-On gasket connection may take a little longer time to make than when using an ordinary steam packing, when once made it will be more durable and seems to improve with age. They say that difficult flanged connections can easily be made with Smooth-On, as it is applied in a plastic state and adapts itself to the flanged faces whether parallel or not. They say that it has been tested to 1500° F. and withstood 400 pounds steam pressure without any injury. "Smooth-On when hard expands and contracts the same as iron, keeping the joint tight at all temperatures, and it will withstand steam, water, fire or oil." Their sixty-page illustrated book, which gives full information regarding this subject, will be sent to any address.

THE J. H. Montgomery Machinery Co. of Denver, Colo., report that they have a rush to fill all orders for their wire rope tramways. They have orders for four at the present time on their books; one of 100 tons capacity per day for Baker City, Or.; one of fifty tons capacity in ten hours for the Silver King mine at Dillon, Colo., this being the second tramway ordered by this company, they having erected one on another one of their mines near there last year. They are also building one of four tons per hour capacity for Montezuma, Mex., and one for Fairbanks, Morse & Co., to be erected in Arizona and to have a capacity of fifty tons in ten hours. They write they have also hooked an order for a set of their 14x27-inch duplex swing frame rolls fitted with Latrobe shells, and other machinery for a small concentrating plant near Cook's Peak, New Mexico.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

THE CONSTRUCTION OF CHIMNEYS, WALLS, ETC.—No. 716,446. Dec. 23, 1902. J. F. Lyman, South San Francisco, Cal. This invention relates to an apparatus for the construction of chimneys, walls and like structures with interior continuous tubes to form flues or other conduits or passages. It consists of strips or plates of material, capable of being closed to make an exterior form, means for rigidly locking them in their closed position, centrally located terra cotta or earthenware tubes, and means for maintaining said tubes in alignment with a smooth interior surface, while concrete is tamped about them and within the exterior casing to form the structure.

AIR TEMPERATURE REGULATING AND PURIFYING DEVICES—No. 716,380. Dec. 23, 1902. L. E. Clawson, S. N. Francisco, Cal. This invention is designed to purify the air within a room. It consists in the combination in an organized apparatus for regulating the temperature of and purifying the air of a horizontally disposed box having within it two walls forming a tortuous air passage, the upper of said walls formed with a series of connecting curves of regular formation and extending in the direction of the length of the box, and the lower wall being formed substantially angular in longitudinal section with openings at the bases of the angles in which the said curves are having within the upper wall; gratings in the upper portion of the curves of said upper wall, adapted to receive a cooling medium; air-forcing mechanism connected to one end of the tortuous passage and a discharge and conductor at the opposite end of the passage.

CARBURETORS FOR EXPLOSIVE ENGINES.—No. 716,573. Dec. 23, 1902. C. N. Nels, Palo Alto, Cal. This invention relates to an apparatus which is especially designed for carbureting or c'arging air with hydrocarbon vapor in such proportions as to render it explosive, and it is especially designed for use upon motor cycles, automobiles and like machines or engines. It consists of a box having within it spaced conical diaphragms forming a partition between the top and bottom. There is a means for delivering the liquid upon the apex of the lower diaphragm, and vertically disposed open ended tubes pass through the periphery of the diaphragm and have openings communicating with the space into which the liquid is admitted. There is a chamber located above the cone into which the upper ends of the tubes discharge, and said chamber has openings from the lower part into the tubes whereby any liquid carried into the chamber may be returned to the tubes.

OIL BURNING FURNACE ATTACHMENT.—No. 716,488. Dec. 23, 1902. J. R. Scott, Oakland, Cal. One-half assigned to E. L. Cook, Diamond Springs, Cal. This invention is designed for furnaces in which oil is employed as a fuel. It consists in a means for injecting a body of steam or air, or both, to meet the products of combustion before the escape through the chimney of the furnace. It consists in combination with an oil-burning furnace of burner jets discharging into the front and the escape flue or chimney of a jet tube to conduct air or steam, said tube discharging into the chimney and against the outflow of the products of combustion and a cock to regulate the current thus introduced.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING DECEMBER 23, 1902.

716,359.—PRESS—R. T. Allen, Fernando, Cal.
716,380.—STUMP PULLER—W. Anderson, Ballard, Wash.
716,381.—AIR PURIFIER—L. E. Clawson, S. F.
716,404.—HOOK AND EYE—Gastren & Cortelyou, Los Angeles, Cal.
716,439.—PUMP—F. Heil, Santa Ana, Cal.
716,514.—SCALE—G. Hoepner, S. F.
716,710.—MEASURING DEVICE—P. Hofman, Los Angeles, Cal.
716,444.—MOP HEAD—J. C. Look, Tudor, Cal.
716,446.—CHIMNEYS, ETC.—J. F. Lyman, South San Francisco, Cal.
716,741.—EXCAVATOR—C. C. McBride, Redding, Cal.
716,573.—CARBURETOR—C. N. Nels, Palo Alto, Cal.
716,468.—SWAGE—E. North, Los Angeles, Cal.
716,483.—CONDUIT—A. C. Ryan, Cherokee, Cal.
716,486.—OIL BURNER—J. R. Scott, Oakland, Cal.
716,650.—WATER MOTOR—Wheeler & Besse, Seattle, Wash.

Latest Market Reports.

SAN FRANCISCO, Dec. 31, 1902.

METALS.

SILVER.—Per oz., Troy: London, 22 $\frac{1}{2}$ d (standard ounce, 925 fine); New York, bar silver, 48c, refined (1000 fine); San Francisco, 48c; Mexican dollars, 38 @39c San Francisco, 38c New York.

COPPER.—New York: Standard, \$11.00; Lake, 1 to 3 casks, \$11.62 $\frac{1}{2}$; carload lots, \$11.30; Electrolytic, 1 to 3 casks, \$11.50; carload lots, \$11.25; Casting, 1 to 3 casks, \$11.35; carload lots, \$11.10. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £52 6s 3d spot per ton.

LEAD.—New York, \$4.12 $\frac{1}{2}$; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4 $\frac{1}{2}$ c 1000 to 4000 lbs.; pipe 5 $\frac{1}{2}$, sheet 6, bar 5 $\frac{1}{2}$ c; pig, \$4.75. London: £10 16s 3d per ton.

SPELTHER.—New York, \$4.70; St. Louis, \$4.50; London, £19 17s 6d per ton; San Francisco, ton lots, 6 $\frac{1}{2}$ c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9 $\frac{1}{2}$ c; Hallett's, 8 $\frac{1}{2}$ c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$25.95@26.00; San Francisco, ton lots, 27c; 500 lbs., 27c; 200 lbs., 27 $\frac{1}{2}$ c; less, 28c; bar tin, 32 $\frac{1}{2}$ c. London, £120 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 per oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.50; large lots; London, £8 15s; San Francisco, local, \$46.00 per flask of 7 $\frac{1}{2}$ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 $\frac{1}{2}$ c; extra, 17 $\frac{1}{2}$ c; genuine, 35c; Eclipse, 37 $\frac{1}{2}$ c.

ALUMINUM.—New York, No. 1, 99 $\frac{1}{2}$ ¢ pure ingots, 35c; No. 2, 90 $\frac{1}{2}$ ¢, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 18c; San Francisco, Plumbers', 100-lb. lots, 15.10c.

NICKEL.—New York, 50@60c per lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$24.25; gray forge, \$21.15; San Francisco, bar, 3c per lb., 3 $\frac{1}{2}$ c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$28.00@30.00; open hearth billets, \$32@34.00; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$25.30@26.00
Foundry Northern 1.....	24.00@25.00
Northern 2.....	23.50@24.50
Northern 3.....	23.00@24.00
Southern 1.....	24.15@25.15
Southern 2.....	23.65@24.65
Southern 3.....	23.15@24.15
Forge.....	22.65@23.65
Charcoal.....	26.00@27.00
Billets, Bessemer.....	33.00@34.00
Bars, iron.....	1.80@1.85
Bars, steel.....	1.75@1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, hoiler.....	1.90@2.00
Tank.....	1.75@1.80
Sheets, 26 store.....	2.90@3.00
No. 27.....	3.00@3.10
No. 28.....	3.10@3.20
Angles.....	1.75@1.80
Beams.....	1.75@1.85
Tees.....	1.80@2.00
Zees.....	1.75@2.25
Channels.....	1.75@2.25
Steel melting scrap.....	19.00@19.50
No. 1 railroad wrought.....	19.50@20.50
No. 1 cast, net ton.....	17.50@18.50
Iron rails.....	25.00@25.50
Car wheels.....	23.00@24.00
Cast borings.....	10.50@11.00
Turnings.....	13.75@14.00

CEMENT.—Germania, \$2.50@2.75; K.

& B. S., \$3.00; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.30; Cut, \$3.30; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for car-load lots.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 $\frac{1}{2}$ c; less than one ton, 17 $\frac{1}{2}$ c. No. 1*, 60%, carload lots, 13 $\frac{1}{2}$ c; less than one ton, 15 $\frac{1}{2}$ c. No. 1** 50%, carload lots, 11 $\frac{1}{2}$ c; less than one ton, 13 $\frac{1}{2}$ c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9 $\frac{1}{2}$ c; less than one ton, 11 $\frac{1}{2}$ c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kg., \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10 $\frac{1}{2}$ c per set; 14 oz., 40s., 9 $\frac{1}{2}$ c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c per lb.; carloads, 24@24 $\frac{1}{2}$ c; in 10-lb. tins, 35c; sulphuric acid, in carboys, 66 $\frac{2}{3}$ B, 2c per lb.; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 24@30c per lb.; blue vitriol, 5 $\frac{1}{2}$ @6 $\frac{1}{2}$ c per lb.; borax, concentrated, 7@8c per lb.; chloride of potash, 12@13c; roll sulphur, 3c; alum, \$2.00@2.25; flour sulphur, French, 3 $\frac{1}{2}$ @3 $\frac{1}{2}$ c; California refined, 2@2 $\frac{1}{2}$ c; nitric acid, in carboys, 8c per lb.; caustic soda, in drums, 3@4c per lb.; Cal. s. soda, bbls., \$1.25 @1.50 per 100 lbs.; sds., \$1.05; chloride of lime, spot, \$2.50@2.60; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins; sulphide of iron, 9c per lb.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.50; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymho, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; lots of 5 bbls., 1c less; Lucol oil, hhd., 48c; cs., 53c; raw, bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 22 $\frac{1}{2}$ c; Astral, 22 $\frac{1}{2}$ c; Star, 22 $\frac{1}{2}$ c; Extra Star, 24c; Eocene, 23 $\frac{1}{2}$ c; Elaine, 26 $\frac{1}{2}$ c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18c; wooden bbls., 20c; cs., 24c; Mineral Sperm, cs., 26 $\frac{1}{2}$ c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23 $\frac{1}{2}$ c; 86° Gasoline, bulk, 21c; do., cs., 27 $\frac{1}{2}$ c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22 $\frac{1}{2}$ c; Lard Oil, No. 1 bbl., 95c; cs., \$1.00; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 55@57 $\frac{1}{2}$ c; cs., 57 $\frac{1}{2}$ @60c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6c; 1 ton and less than 5 tons, per lb., 6 $\frac{1}{2}$ c; 500 lbs. and less than 1 ton, per lb., 7c; less than 500 lbs., per lb., 7 $\frac{1}{2}$ c; in 25-lb. tin pails, 4c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 2 $\frac{1}{2}$ c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6 $\frac{1}{2}$ c.

RED LEAD AND LITHARGE.—One ton and over at one purchase, per lb., 6c; 500 lbs. and less than 1 ton, per lb., 6 $\frac{1}{2}$ c; less than 500 lbs., 7c.

ASSAY LITHARGE.—Per lb., 8 $\frac{1}{2}$ c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c per lb.

BORAX.—Crystal, 7c; calcined, 25c.

CHROMIUM.—(90% and over) per lb., \$1.25.

COPPER.—Carbonate, 20c; Red oxide, 60c.

MANGANESE.—(90% and over) per lb., \$1.25.

MERCURY.—Bichloride, per lb., 90c.

MOLYBDENUM.—25c per gramme; 1000 grammes—2 $\frac{1}{2}$ lbs.

PHOSPHORUS.—(American) per lb., 80c.

SILVER.—Chloride, per oz., 75c; nitrate, 55c.

SODIUM.—Metal, per lb., \$1.00.

URANIUM.—Oxide, per lb., \$3.50.

ZINC.—Metallic, chemically pure, per lb., 50c.

ZINC.—Dust, per lb., 10c.

ZINC.—Sulphate, per lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

MINING AND SCIENTIFIC PRESS

Whole No. 2216.—VOLUME LXXXVI.
Number 2.

SAN FRANCISCO, CAL., SATURDAY, JANUARY 10, 1903.

THREE DOLLARS PER ANNUM.
Single Copies, Ten Cents.

A Typical California Enterprise.

In El Dorado county, California, the gold belt is wider than in the counties farther south, and it embraces a more diversified geological field. In the neighborhood of Placerville, however, the mines bear a striking resemblance to some of those about Quartz and Stent, in Tuolumne county. In fact, these two sections bear a greater similarity than any two other portions of the mother lode. A marked difference is noticed in the topography of the two sections, however; the country about Stent and Quartz being relatively flat, while north of Placerville the American river has cut deep into the slates and schists. The River Hill mine near Placerville affords a typical illustration of the character of the mines of the vicinity. The formation is slate, serpentine and dolomitic material, with gold-bearing quartz. It is at present worked through a shaft and is equipped with a modern 20-stamp mill, illustrations of exterior and interior of which are shown herewith. A crosscut tunnel is being driven 2500 feet to the vein on the 900 level. When this is completed a new and larger mill will be built at the mouth of the tunnel. The third illustration shows a section of the vein in the face of a drift. T. Clark of Placerville is manager.



The Vein in River Hill Mine, Near Placerville, Cal.

At the present session of the California Legislature a bill will be introduced creating the office of mine inspector for the State of California. Several attempts have heretofore been made to have this office created, but each time it has met with strong opposition, mostly from those having no personal interest either for or against the bill. The reason for this opposition probably lies not so much in the fact that those voting against the proposed bill know little or nothing of the duties of a mine inspector,

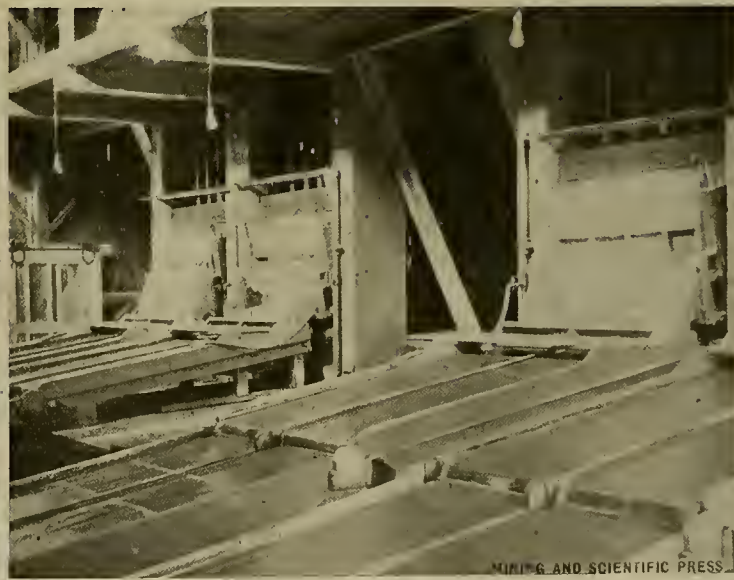
shall not be done in their absence. In case of any material change in policy or method in mining, the change must be made without waiting to consult the inspector or anyone else. Most mine superintendents in California are accustomed to going underground every day, each one of them acting as his own inspector, and in a time of unusual danger they will usually be found "in the thick of it," doing all

things in the twentieth century, prolific in discovered possibilities, give promise of this century's achievements outdoing those of the last one. In geology, which carries the idea of illimitable time; in astronomy, which conveys the idea of illimitable space; in chemistry, which carries the idea of illimitable subdivision and creation; in electricity, which almost justifies the idea of illimitable energy; in metallurgy, which includes the idea of increased underlying profit; in every department of science (which is organized knowledge) and art (which is applied science) is shown great advances—promise of further unfolding in this great constant history of the earth, a tremendous life history, steadily progressing toward ultimate completion.

SEVERAL of the largest mining companies of the Cœur d'Alene district, Idaho, have refused to pay taxes on their mines. The taxes upon improvements they have always paid, but it is the assessment of the mines themselves that they are combatting, and they will endeavor to have the law declared unconstitutional. The mines of that section have had, it would seem, more than their share of hardship already in the way of labor troubles, with low and lower prices for their product, and now that the expense of mining is increasing rather than diminishing, and other conditions give little promise of improvement, this taxation on property of uncertain and always lessening value looks something like the "last straw to break the camel's back." The towns of the district were built up wholly as a result of mining operations there, and were all the mines to close the towns would soon be nothing but a memory. It seems not only unjust, but unwise on the part of the local government to attempt this sort of extortion at a time when conditions affecting the prosperity of the



River Hill 20-Stamp Mill, El Dorado Co., Cal.



Interior River Hill Mill, El Dorado Co., Cal.

tor, or whether or not the creation of such an office would prove beneficial to the mining industry or the miners, as in a desire to have no additional political offices created. Theoretically, the office of mine inspector is all right, but that it practically proves a direct benefit is less apparent. The history of mining in California does not indicate that much would have been gained by the miners had there been a mine inspector in past years. The mines generally are of a character requiring skillful handling, and this proves a better present safeguard than any number of inspectors, who dictate what shall or

any one could do. Such men do not require a slide rule and a code of regulations to know what should be done.

THE new year is signalized in science by some notable advances in mining and scientific progress, prominent among which are the announced ability to produce cyanogen from the atmosphere, the transmission of wireless messages across the Atlantic, and telegraphic communication with Hawaii in the mid-Pacific. The impossible is being limited to that which is not yet possible, and the two years in the

mines of the entire district are so unsatisfactory.

IN the issue of the MINING AND SCIENTIFIC PRESS January 17 will begin the publication of an article by Dana Harmon, of San Francisco, Cal., on "Stamp Milling and Amalgamation of Free Gold Ores," illustrated with a number of carefully drawn sketches. This is a matter that interests every mill man and mine superintendent engaged in gold mining, and the subject is handled in a masterly and thoroughly practical manner by Mr. Harmon, who has had a wide and successful experience in milling gold ores.

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TABLE OF CONTENTS.

ILLUSTRATIONS:

	Page.
The Vein in River Hill Mine, Near Placerville, Cal.....	17
River Hill 20-Stamp Mill, El Dorado Co., Cal.....	17
Interior River Hill Mill, El Dorado Co., Cal.....	17
Sketch Showing Proposed Mining Method.....	21
Main Flume and Battery Flume.....	22
Section of Channel.....	22
New Home of Paraffine Paint Co., San Francisco, Cal.....	23
Timbering and Filling Stope, Bunker Hill & Sullivan Mine.....	23
Timbering and Filling at the Standard Mine.....	23
Wallace Steel Crusher.....	24
The New Building of the Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.....	24
An Interior View of the Hendrie & Bolthoff Mfg. & Supply Co.'s Establishment, Denver, Colo.....	24
Rowe Feeder System.....	25
Mining and Metallurgical Patents.....	26

EDITORIAL:

A Typical California Enterprise.....	17
A State Mine Inspector.....	17
Advances in Mining.....	17
Taxes on Cour d'Alene Mines.....	17
"Stamp Milling and Amalgamation of Free Gold Ores".....	17
The Precious Metal Output for 1902.....	18
Chlorination of Gold Ores in California.....	18
Consolidation in Mining.....	18

MINING SUMMARY 27-28-29-30-31

LATEST MARKET REPORTS32

MISCELLANEOUS:

Concentrates.....	19
The Geologic and Economic Aspect of Tonopah, Nev.....	20
Experiences of a Working Miner.....	20
A Suggested Mining Method.....	21
The Use of Oil for Fuel.....	21
Organizing Local Mining Districts.....	21
Method of Mine Sampling.....	21
An Experience in Drift Mining in Hard Cement Gravel.....	22
A Study of Amalgamation Methods, With the Object of Avoid- ing the Loss of Mercury.....	22
The New Home of the Paraffine Paint Co.....	23
The Mining Industry of the Cour d'Alenes, Idaho.....	23
Wallace Steel Crusher.....	24
The Hendrie & Bolthoff Establishment.....	24
Fifth Annual Report Lincoln Mine.....	25
New Coal Dust Burning System.....	25
A Shift in the Mill.....	25
Mining and Metallurgical Patents.....	26
Specimens Received.....	26
Personal.....	31
Catalogues Received.....	32
Commercial Paragraphs.....	32
Obituary.....	32
New Patents.....	32
Notices of Recent Patents.....	32

The Precious Metal Output for 1902.

The preliminary figures for the output of precious metals in the United States in 1902 have been received from Director of the Mint George E. Roberts. The gold output shows an increase for the year of \$2,186,370, and silver a net increase of \$3,352,084. Following is the estimated production by States:

States and Territories.....	Gold Value.	Silver Value.
Alabama.....	\$ 2,873	\$ 5,000
Alaska.....	7,823,793	30,061
Arizona.....	4,155,099	1,680,100
California.....	17,124,941	480,793
Colorado.....	27,502,429	9,085,714
Georgia.....	102,388	445
Idaho.....	2,067,183	3,180,000
Maryland.....	2,956	2
Michigan.....	30,800	42,930
Montana.....	4,134,365	6,890,000
Nevada.....	3,514,212	2,120,000
New Mexico.....	688,400	298,602
North Carolina.....	91,783	11,498
Oregon.....	1,860,465	63,600
South Carolina.....	347,928	152
South Dakota.....	7,398,057	182,373
Tennessee.....	145	
Texas.....	600	250,357
Utah.....	3,720,930	6,360,000
Virginia.....	4,444	273
Washington.....	434,100	360,400
Wyoming.....	45,230	2,756
Totals.....	\$81,053,121	\$31,045,056
Klondike.....	14,562,101	91,768
Nome (including Alaska).....	5,023,256	9,540

A comparative study of production for the past three years shows a net gain over 1900 of about

\$3,500,000, and over 1901 of about \$640,000. The rapid depreciation of silver has undoubtedly helped to reduce the output by many hundreds of thousands of dollars.

Although the output of Alaska in 1902 exceeded that of 1901 by \$119,000, it still lacked about \$348,000 of reaching the output of 1900. Colorado in 1900 produced \$28,829,400, and in 1901 statistics showed a production of \$29,000,000. The year 1902 shows \$28,829,400, or a loss of \$170,600. California shows a substantial gain—\$1,308,741 over 1900 and \$1,294,941 over 1901. Arizona shows a slight gain over the two previous years. Nevada shows a gain of \$500,000 in gold, and South Dakota gains \$796,257 in gold production. All producing States show some change, but those above mentioned are the most important and noticeable. Official and exact reports will soon be issued, but no considerable change can be anticipated from the figures above given.

Chlorination of Gold Ores in California.

In the chlorination process, as practiced in California, the ore, consisting either of the concentrates from a single mine or a mixed concentrate from several mines, is dumped into the hopper of a reverberatory furnace containing from 4% to 10% moisture. Some of these furnaces have mechanical stirrers. It receives no preliminary treatment. The fuel is either wood or crude petroleum. Six months' experience at the Sutter Creek, Amador county, Cal., reduction works has demonstrated the great advantage of oil over wood for use in reverberatory furnaces. The ore is raked forward from one section of the furnace to the next. As soon as that portion of the hearth immediately beneath the hopper is made vacant by removal of the previous charge, another fresh charge takes its place, to be in turn moved forward when the charge preceding it has been moved another step ahead. The furnace remains very hot after the raising of the heat on a charge of ore about to be withdrawn, and this heat is sufficient to dry the raw ore on the first hearth, ignite it on the second and to partially roast it on the third. When the semi-roasted ore reaches the last section of the furnace—that nearest the burners—the oil is ignited by means of a bunch of oiled waste tied to the end of a long iron rod, which is inserted through one of the doors. Steam is kept up in a small boiler, under which coal is burned. This also keeps the oil in a fluid condition for rapid and easy flow. The oil is pumped to the burner and an intense flame—though one which is always under perfect control—results. The dead roast is usually accomplished in from fifteen to twenty minutes, after the charge has reached the last hearth, when the oil is shut off; but, as previously stated, the furnace continues to glow until nearly time to turn on the high heat again. The work has never been so satisfactorily and so perfectly done by means of wood. Some ores require the addition of salt in the furnace to chloridize certain elements, which would otherwise absorb a large amount of chlorine when the charge comes to be gassed. As the amount of silver in the California concentrates is usually very low, no particular effort is made to save that metal.

The means for determining the condition of the roasted pulp are various. Kustel, in his work on chlorination, suggests that a rapid method is to throw a small quantity of the roasted ore into water and then plunge a bright iron rod into the water. If sulphates remain in the ore the surface of the iron will become darkened, and the ore must receive a further roasting. This is said by Rose, in his work on "Gold," to be an unsatisfactory test with some ores, as with some the presence of sulphate of iron would not be detected in this way. He suggests a more trustworthy and equally simple test, which is to throw a little of the roasted ore in water and then add a few drops of barium chloride, when a white cloud (barium sulphate) will form, indicating the presence of soluble sulphates.

When the ore is determined to have reached the stage known as "dead roast," that is, when no more sulphates remain undecomposed, it is withdrawn from the furnace, dropping through a trap in the floor and falls into a steel car standing in a pit beneath. The car when filled is wheeled to the cooling

floor and dumped and the pulp spread out, when a stream of water from a hose is turned on it for a few minutes. When the ore has been dampened sufficiently it is charged into a wooden tank, the interior of which is usually painted with a preparation of paraffine, and which is provided with a false bottom.

The false bottoms are much the same everywhere, being made with graduated sizes of coarse to fine gravel, the whole resting on a canvas floor and being covered with an open floor of shovelling boards. The damp pulp is usually thrown onto a screen, which is shaken to make the ore fall as lightly as possible. When the tank is filled to 4 or 5 inches of the top a folded gunny sack is laid on the surface of the charge and the cover of the tank suspended from the timbers overhead is lowered by means of chain blocks and placed in proper position and luted on. At the Angels chlorination works, the largest in California, the tanks are girdled by an annular trough partly filled with water, and the covers are provided with a flange-like downward projection which fits into the water channel of the tank forming an air-tight joint. This has its advantage over the luting process.

Chlorine gas is evolved from a mixture of 100 pounds of salt and ninety pounds of manganese oxide, by means of sulphuric acid in leaden generators. Acid is added until the charge ceases to evolve gas. The chlorine passes along pipes and is conducted underneath the tanks into the bottom of the charge, and slowly ascends through it. The appearance of the gas at the surface of the charge is detected by applying a bottle of ammonia to a small hole in the cover of the tank, which is plugged excepting when the test is being made. If the chlorine gas has ascended through the charge to the surface a dense cloud of ammonium chloride forms. When this occurs the gas is shut off from this particular tank, and the charge allowed to stand a variable number of hours, determined by the experience with the material being treated. At the proper time a stream of water is turned into the tank through an opening provided for the purpose, the water falling upon the folded gunny sack which had been placed there. This has a tendency to prevent the formation of channels in the charge, or to cause strata of slimes to accumulate which would retard percolation. When the water reaches about 3 inches above the surface of the charge, a valve beneath is opened (though at some works the water is allowed to stand for some time on the charge) and the liquor drawn off to the precipitating vat. When a large amount of gold solution has been collected in a vat, a solution of iron sulphate is poured into it and dense clouds of black precipitate appear. The liquid is permitted to settle and is tested from time to time until the merest trace of gold remains in the solution when it is discharged.

If the ores contain much copper the solution is run into a large tank in which is a quantity of wrought iron scrap, tin scrap, etc., and the copper contained in the solution is recovered as cement copper. The gold tanks are decanted, the precipitate collected, dried, and mixed with suitable fluxes is melted into bars. If care be taken in the melting, all dross being removed, a high grade of gold results. Although there are a number of furnaces in California where this method of treating vanner tailings and canvas plant slimes is in use, none of them have been able to introduce any marked feature in the way of economy of handling materials, as in large cyanide plants, but this is due, no doubt, to the restricted supply of sulphurets. Few of the furnaces burning wood have over three and a half tons daily capacity and none burning oil over seven, and as the greatest number of furnaces in operation in any one plant does not exceed five (that of the Utica mine at Angels, Calaveras county), it is seen that the industry is necessarily conducted on a limited scale.

Barrel chlorination is not practiced in California at all, though with cheap power usually available in most mining districts its introduction would soon displace the present process.

CONSOLIDATION and merging goes on in mining operations in accordance with the present general law of business concentration, the reduction of expense and the elimination of waste.

CONCENTRATES.

A UNITED STATES PATENT may issue covering both a quartz and a placer claim.

THE best grades of Missouri and Kansas zincblende, it is claimed, contain about 60% zinc.

HEAVY pyritic ores require a steeper grade on mill plates than quartz ores. A grade of $1\frac{1}{2}$ inches per foot is normal.

THE statement that 60% copper matte is made from raw ore with a single smelting may be taken with some allowance.

PETZITE is telluride of silver, in which the silver is often partly replaced by gold. It occurs in California pocket mines.

THE presence of iron in solution in water is denoted when, upon the addition of one drop of ferro-cyanide of potassium, a blue color appears.

BEACH MINING is still carried on in a few places on the Pacific coast south of Alaska, but it is the least important kind of mining now practiced in the west.

FOR some unexplained reason a number of wires twisted into the form of the regulation cable has not the tensile strength of the aggregate of the individual wires.

WULFENITE is a soft yellow mineral (molybdate of lead) usually occurring in tabular crystals. Wolframite is a hard black mineral, a tungstate of iron and manganese.

THE purest gold obtainable has a tensile strength of 14,000 pounds per square inch. Gold containing one part in 2000 of bismuth can almost be crumbled in the fingers.

A CAREFUL study of the various rocks and material generally found in gravel channels will give a very fair idea of the character of the country through which the stream has passed.

A MINE near Garland, Colo., has the distinction of being what is probably the highest mine in the United States. It is at an altitude of 14,400 feet near the summit of the Sierra Blanca.

"PROPYLITE" is obsolete. It was a name given by Zirkel and Stache to certain rocks of Washoe district, Nevada, which later investigators have determined to be altered hornblende andesite.

WHERE placer locations are taken up on land previously surveyed by the Government, and conform to the legal subdivisions as nearly as possible, no further survey or plat shall be required.

EVERY stamp mill should be so arranged that at least one battery can be employed separately in making test runs on rock from various parts of the mine, independently of the balance of the mill.

THE capacity of a blast furnace is largely increased by employing hot blast. Other considerations in capacity are fusibility of the ore, quantity of flux required and the pressure and volume of the blast.

THE DIRECTION of ventilation between mine shafts that are connected underground sometimes changes with the seasons. A shaft that is upcast in summer becomes downcast in winter, or vice versa.

THERE are no so-called pyritic smelters in operation in the United States, so far as Concentrates is aware, where some carbonaceous fuel (usually coke) is not employed. It is essentially a "partial-pyritic" smelting.

THE best treatment amalgamating plates can receive is a good coat of gold amalgam. This cannot be obtained where low-grade gold ore is being milled and where the plates are scraped twice a month with steel chisels.

TO TEST sulphate of lime (gypsum), place in a test tube about 2 inches of the water and then add a little barium chloride: If a white precipitate is formed, and it will not be redissolved when you add a little nitric acid, sulphate of lime is present.

IT is a wise plan to have one man handle most of the powder in a mine employing a large number of men, as where the boxes are open to every one on shift it has been shown that the proportion of accidents from premature explosion is of more frequent occurrence.

IT HAS been stated that battery water at a temperature of 52° F. gives the best results in amalgamation of gold ores. A series of experiments were made at the Homestake mills, South Dakota, several years since to determine this point and the above announcement was the result.

TO ASCERTAIN whether water contains carbonic acid,

take a small quantity in a test tube and add a few drops of lime water. If carbonic acid be present the water will become milky (calcium carbonate), which, upon the addition of a few drops of hydrochloric acid, will again become clear.

GOLD occurs associated with iron sulphide (pyrite) in the form of invisible plates and grains, in those which are visible and in a few rare instances in masses as large as wheat grains or larger. An instance of the latter character is found in the Gambetta mine, Grub Gulch, Madera county, Cal.

THERE are those who still claim hand feeding in a stamp mill is superior to machine automatic feeding. This may be. But the man who has the intelligence to feed a stamp battery with a shovel better than it can be done by an automatic feeder is worth more to his employer doing something else.

EVERY well-managed quartz mill should have an automatic tailings sampler. It is unsatisfactory to take samples with a tin cup from the lower edge of a plate. The slightest touch to the plate is likely to salt the sample to such an extent as to render it worthless. There are several kinds of automatic samplers.

IN WORKING low-grade ores, the best modern practice is to employ low, quick discharge, large capacity, and do all the amalgamating outside the battery. Some feed quicksilver into the battery, but have no inside plates, and others feed all quicksilver outside. A mill man should adopt the practice which produces the best results.

TO TEST magnesia, fill a test tube one-third full of the water; hold it with the tube holder and bring it to a boil over the spirit lamp; then add a very few crystals of ammonia carbonate and a little soda phosphate. If magnesia is present, it will form a white precipitate; but as it may not do so at once, it is best to set it in the rack for a few minutes.

THE advisability of working mines single-handed or double-handed has been frequently discussed for half a century and there is a wide difference in opinion on the subject; but, on the whole, those who favor the single-handed system seem to have some advantages on their side. Doubtless the percentage of good double-handed strikers is greater than of good single-handed strikers.

THE AMOUNT of water used in a 5-stamp battery varies from $1\frac{1}{2}$ to $6\frac{1}{2}$ gallons per minute per stamp. In some California mills, where water is scarce, the least possible amount is employed. From 1000 to 2500 gallons of water are required to treat one ton of ordinary gold rock. The character of the ore and the coarseness of crushing must determine the amount of water to be employed. On the outside plates the grade of the plates will make a great difference in amount of water required.

THE "purple of Cassius" was discovered by Cassius of Leyden in 1683. It consists of gold and the oxide of tin, and is employed in coloring glass and glazes shades of violet, red and purple. It may be made by dissolving one-half gramme of gold in nitro-hydrochloric acid, composed of 16.8 grammes of hydrochloric and 10.2 grammes of nitric acid, and the solution diluted with 14 liters of water. To this solution is added, drop by drop, a solution of a mixture of protochloride and tetrachloride of tin.

THE consumption of cyanide on fresh concentrates varies with the composition of the concentrates. It is said that concentrates containing marcasite cause a greater loss than those of pyrite alone. The presence of copper compounds, physically soft, also tends to increase consumption of cyanide. The hard, dense sulphides of copper affect cyanide solutions but little, but those partly oxidized cause great loss. Some zinc sulphides containing gold can be treated with cyanide, but this can never be determined without experiment.

BY PRESSURE alone particles of pure gold may be made to cohere, but nuggets, found in placers, are not the result of pounding together of numerous small pieces and flakes of gold by the rocks associated with it in the stream. The effect of the detritus upon particles of gold in the bed of a stream is to reduce each particular piece, whatever its size, to a smaller size, and to eventually practically destroy it by abrasion. Though no longer visible the particles of gold—infinitesimally small—are still in the bed of the stream.

THE right to follow a vein on its dip beyond the side line of a quartz claim, known as the "extralateral right," in no manner refers to placer claims, or to ancient river channels, no matter at what depth, or under what conditions they occur. If no known paying mineral had been discovered on B's claim up to the time of issue of patent, any discovery subsequently made would not effect his title. The fact that B had previously made a mineral location on the land would make no difference if he did not really find mineral in paying quantity.

GRAVEL DEPOSITS containing gold which are located below the level of an adjacent stream may be worked by means of the hydraulic elevator, by means of which the gravel is carried upward in an inclined box or pipe by a

stream of water directed upward under heavy pressure. The height to which the gravel may be hoisted in this manner is dependent upon the quantity of water and the head available for the purpose. This principle is now being employed to keep the water in the Comstock, Nevada, mines 400 feet below the Sutro tunnel level.

IN THE placer deposits of California occur gold, native copper, lead, platinum and nickel, also diamonds and iridosmine, but the most common is the black sand, partly magnetic, probably derived from the greenstones and other eruptive and intrusive rocks. In Calaveras county, one mine near Mokelumne Hill has become noted for the large and abundant quartz crystals found in the wash. These are probably derived from a vein occurring near the place where the crystals have been found, but the vein has not as yet been discovered. Petrified wood is abundant in many river channels, ancient and recent.

GOLD is the only metal which has a yellow color in mass. The introduction of impurities changes its color greatly. Silver lowers and copper heightens it. In a state of fine division, when prepared by volatilization or precipitation it assumes various colors, as violet, ruby, and reddish purple, sometimes nearly black. Some eminent chemists have thought these colors due to an oxide film, but the most careful tests have failed to show the presence of oxygen, and the highest authorities now claim it to be metallic gold. Gold in thinly-beaten sheets is transparent and by transmitted light is green, of lighter or darker shade, according to the thickness of the sheet.

THE order in which stamps fall is of importance. It has been found that they can not be permitted to fall in sequence, as 1, 2, 3, 4, 5, as this would have a tendency to drive all the pulp to one end of the battery. For similar reasons they should not fall in any manner calculated to cause pulp to accumulate in one portion of the mortar while it becomes low in another part. The drops most in use are 1, 3, 5, 2, 4 and 1, 4, 2, 5, 3; 1, 5, 2, 4, 3 and 1, 5, 3, 2, 4 are also in use. In most mills ten stamps on a single section of the cam shaft are arranged so that no two shall drop at the same time. This is accomplished by setting both batteries to drop in the same manner, the No. 1 of the second battery falling immediately after No. 1 of the first, the entire ten stamps falling in the same time that is required to drop the five in both batteries.

THE Sutro tunnel at Virginia City, Nev., was driven under a special permit by Congress. No other tunnel has since been able to condemn a right of way through property belonging to others, to reach property owned by the tunnel owners lying beyond. Therefore, those desiring to locate a tunnel site must be the first to locate in the vicinity. Following is the text of the United States Statutes concerning tunnel locations: "Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession of all veins or lodes within 3000 feet from the face (meaning mouth) of such tunnel, on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered on the surface, and locations on the line of such tunnel, or (of) veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with due diligence, shall be invalid; but failure to prosecute the work on the tunnel for six months shall be considered an abandonment of the right to all undiscovered veins on the line of said tunnel."

PANS for amalgamation in mills are always provided with a false bottom in sections, that the wearing parts, called shoes, may be replaced by new ones when worn. The idea of the pan no doubt originated from the arrastra. Ores are worked in pans either raw or roasted. In addition to ore, water, salt and bluestone are added, and steam turned into the charge which is ground, the muller being lowered for this purpose. When the pulp has been ground to the proper fineness and the original chemical combinations of ore broken up, the muller is raised slightly and quicksilver added, and the pan is again revolved for several hours, usually from six to eight. If the mullers were not raised it would result in the sulphides and mercury being ground to such a fine state of division that the quick would become floured and rising to the surface float like soapbuds on the top of the charge, being eventually lost. When amalgamation is supposed to be completed, water is added to thin the pulp and the quicksilver settles to the bottom, being drawn off through a "well" which is situated outside the pan and connected with it by a syphon. Beside the flowing mercury there is frequently found a considerable amount of hard amalgam attached to the mullers and sides of the pan. Ore containing black oxide of manganese causes the mercury to sicken, and this is usually corrected by adding a quantity of quicklime to the charge. In addition to the chemicals above enumerated, nitre, cyanide of potassium and sodium amalgam are about the only other ones used in pan amalgamation. The Boss process is similar to that above described, excepting that the pulp passes from pan to pan, the pans being set on terraces, each a little lower than the next. The first three or four pans of the set are used as grinders and the remainder as amalgamators. In a pan mill there are also settlers and agitators, employed to effect as complete a separation as possible of amalgam.

The Geologic and Economic Aspect of Tonopah, Nevada.

Written for the MINING AND SCIENTIFIC PRESS.

Like a rare jewel in its rough matrix, Tonopah is encompassed by an unique environment. Lying in the heart of the desert, remote from the highways of commerce, its surroundings must needs seem forbidding. Inaccessible, as measured by modern standards, it surely appears to the distant observer engulfed in a mirage, phantasmal, intangible.

Situated at an altitude of 6000 feet upon both a topographical and geological summit, with an elaborate system of veins, it promises to become a large producer of bullion as well as to become the center of a diversified mining district. In respect alone to the latter it invites serious investigation. There have been a number of discoveries within a radius of from 5 to 15 miles. While those outside discoveries are necessarily new and largely undeveloped, they nevertheless are impressed with noteworthy earmarks. The miners and prospectors of the outlying districts, accustomed to measure all values by the bonanza standards prevailing in Tonopah, are slow to grasp the real merit of lower grade ores. They are, it would seem, equally backward in discounting the future to the extent of recognizing that, with known reserves, present conditions can be readily and happily changed so that their ores may be marketed, or reduced to bullion, within limits of cost obtaining elsewhere.

The topography of southern Nevada is largely made up of a series of north and south ranges, or true geological anticlines, separated by parallel desert valleys, or synclines, which are generally from 20 to 40 miles apart. These anticlinal ranges are continuous for great distances, although sometimes terminating, like a great half-dome, in an east and west valley, which often join the flanking valleys of the north and south range.

It thus happens that, contrary to the law which so generally prevails, the anticline is preserved as the present topographical summit. Synthetically, the syncline or trough remains to-day as the topographical valley. Those valleys, which now constitute the true desert areas of that region, are totally devoid of running water and are studded with salt and borax marshes. Their transverse profiles are sweeping, majestic lines, and their altitudes generally about 4500 feet.

It is on the summit of one of those ranges that Tonopah is situated. The reader will therefore appreciate the bearing which such structural geology and coincident topography has upon the meager water supplies derived from intercepting works near the summits of such ranges. Thus it happened that water originally sold for 5 cents per gallon, and it is now commanding a price of 3 cents per gallon. Such supplies are necessarily secured from the seepage of limited catchment basins. The average annual precipitation is only about 8 inches. Evaporation is excessive over all those barren wastes, and the high winds which prevail throughout the greater part of the year only augment the atmospheric absorption.

Some of the ranges to the north of Tonopah, however, attain altitudes as great as 11,000 feet, particularly Mt. Jefferson and Ark Dome. At that altitude precipitation averages 40 inches. Evaporation is correspondingly decreased. Although those mountains are 70 miles north of Tonopah, their water supplies, if properly conserved, have economic value.

It must not be inferred that the surface rocks of Tonopah, or of that part of Nevada, are the older sedimentaries which had been subjected to folding. Upon them are superimposed great masses of later rocks—all of volcanic origin. The feldspathic silicates dominate much of the area. Along the axes of the anticlines lines of structural weakness developed. Those lines at a later period became the vents for volcanic flows which in a molten or plastic state overflowed the hillsides in great creeping sheets, reaching to the valleys below, and building up on the mountains, transforming and disfiguring the gentle contours of the country into more rugged and precipitous lines.

When a partial equilibrium had been restored to the source of volcanic supply, a semi-quiet period intervened, so far, at least, as the discharge of the volcanic products were concerned. It was during this period, probably, that considerable faulting and fissuring took place—creating many of the fissures which were then and later to receive metallic filling. Coincident, also, with this quietest period, the fissures and vents became the fumaroles from which steam, charged with gaseous combinations of chlorine, fluorine and sulphur, came roaring to the surface. Under such solfataric action, many of the rocks were greatly altered, while vein matter was derived from a deep-seated source. Thus it was that the lode-porphry, locally termed rhyolite, became an alteration product. Still later, as the hydro-dynamic forces became more stable, emissions of carbonic acid and combinations of hydrogen and carbon succeeded.

During these periods the ores were in process of

formation. It is not contended that their origin may be ascribed wholly to sublimation, but, perhaps, to a combination of agencies, in which sublimation, infiltration, thermal action and thermal mediums were all more or less active.

It is suggested that this brief outline of ore derivation is not put forth as a finality at this early date, but rather that it may serve to bring the subject into discussion.

Still later, and succeeding ore deposition, volcanic overflows again took place, thus capping the veins. As new vents and volcanoes were opened, they probably faulted and threw the veins into their present alignment. There can be little doubt that some of the buttes adjacent to Tonopah are extinct volcanoes.

In a width of perhaps 1500 feet there are fifteen known veins, all rudely parallel, and ranging in width from 18 inches to 8 feet. They stand nearly vertical and carry considerable known quantities of ore ranging in values from \$60 to \$150. Some shoots are of a much higher grade, while there are, of course, large bodies of much lower grade. Indeed, there are regions where the lode-rock is impregnated with commercial values for short distances from the vein—in some places for as great a distance as 20 feet. Those regions add, of course, to the measurable reserves, and, together with the lower grade ores, will become definite assets when local treatment and power shall have been introduced into the camp.

The veins strike west and southwest, while the axis of the range runs north and south. The vein system lies wholly on the western slope and within 1 mile of the summit. New discoveries to the west are being made from time to time, which add materially to the longitudinal extent of the system. This gives rise to the logical deduction, considering the unusual width of the fissure zone, that their metallic contents, covering the area they are known to cover, may be expected to extend to considerable depths. It was on a consideration of this fact, viz.: the relative length and width known in the early days on the Comstock, that the downward extension of that lode was predicated with a certainty that later developments strikingly fulfilled.

The nearest railroad station to Tonopah is either Sodaville or Candelaria, both on the Carson & Colorado Railroad, a narrow-gauge spur of the Central Pacific. Both are 60 miles west of the camp. Another outlet is had 110 miles north via Austin, which is the southern terminus of the Nevada Central Railway. This road is another narrow-gauge feeder of the Central Pacific.

Extensions from both roads can be made at a very reasonable cost and without involving excessive gradients or adverse alignment. It is believed that the distance to the projected Salt Lake & Los Angeles Railway will not be greater than the distance to Austin.

Via present connections, San Francisco is the nearest center, and it now enjoys most of the Tonopah trade. With a connection south to the Los Angeles road (commonly known as the Clark road), Los Angeles or Salt Lake will become the logical trade center for Tonopah and her district.

While nature has been prodigal of her mineral wealth in the veins thus far exploited, she has underwritten an antithesis of this in her niggardly provision for fuel. Wood sells for \$15 per cord. It has to be hauled from 12 to 20 miles. Stulls, 6 to 8 inches diameter and 7 feet long, sell as high as \$1 each. Fortunately, however, the ground is almost all self-sustaining, and the veins and country being very dry, there is no swelling. All sawed material is shipped 200 miles by railroad, thence by wagon 60 miles, costing, laid down, \$50 to \$70 per M feet.

With the exception of about 75 H. P. generated by steam, the remainder of the power of the camp, aggregating about 1000 H. P., is produced by gasoline. Gasoline, it is understood, costs 40 cents per gallon. On an estimated consumption of one-tenth of a gallon per horse-power hour, each horse power will aggregate about \$300 per annum for fuel alone on a 24-hour basis. If cost of attendance, oil, waste, repairs, depreciation and interest charges be added, power is costing by reason of the small units in operation not far from \$500 per power per annum.

The power thus far consumed is used almost exclusively for hoisting. There are a few small compressors actuating as many "chippy" drills.

Miners' wages are \$4 per shift. Board and lodging costs from \$1.50 to \$2.50 per day. Wagon freight on ore to the railroad is \$10 per ton, while incoming freight runs from \$20 to \$28 per ton, according to class. The cost of all freight and treatment charges aggregates about \$40 per ton—shipments going largely to Salt Lake and Selby smelters.

That the mines have continued to ship thousands of tons of ore under such adverse conditions is perhaps the most potent and flattering comment on the exceptional value of Tonopah ores. That prospecting and development goes forward with increasing energy, bespeaks a future for the camp which will be infinitely more eloquent and convincing than the most optimistic monograph could now portray.

The elements of uniqueness which dominate Tonopah as a camp and as the center of a mining district are seldom paralleled. Mindful that the camp has ore reserves of unusual extent, considering its short life and the adverse conditions of mining; with a posi-

tion in the midst of a desert, 60 miles from rail; without water in sufficient quantity for either metallurgical or steaming purposes; without fuel and without power; without reduction works and without a nearby market for its ores, its unique isolation is accentuated. These desiderata emphasize the inviting field offered for the necessary adjuncts of power and water.

OBSERVER.

Tonopah, Dec. 26, 1902.

Experiences of a Working Miner.

Written for the MINING AND SCIENTIFIC PRESS.

The way some people sink shafts would astonish you. Naturally you would expect the superintendent of a mine to know how a shaft should be sunk, even if he were not himself capable of personally executing the work. Of course we all believe the superintendent should possess sufficient experience, or talent, or something, to see that his shaft is kept straight when there is no object in the world to make it otherwise. The B— mine was down 500 feet and the shaft was being sunk deeper. In connection with this it is merely incidental to say that no single 100-foot section of the shaft, between the 500-foot station and the surface, was really straight. In some manner—just how I am not aware, unless it was the fault of the timber framers—the north end of the wall plates on the 500 level were several inches lower than the south end. D— was a new foreman and ran things to suit himself. He saw a way to remedy the trouble. He would cut the posts short on the high side for several sets and level up the wall plates. This was in an inclined shaft, pitch about 53°. Some of the more experienced shaft men suggested that the difficulty could not be satisfactorily remedied in that manner, but D— persisted, and as a result when the 700 level was reached the shaft was not less than 13 feet out of line, having swung to the northward, and also taken a twist of not less than 10°.

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The assay office is sometimes a good place to pick up a few points, as well as in the depths of the mine. R— was assayer and chemist for the W—M. Co. He had a great many assays to make, so he said, an average of possibly eight daily. He used to keep the buttons he made in the process of assaying, both concentrates and ores, and also chips cut from gold bars for the purpose of making bullion assays. He managed, by being very careful and saving all the buttons, and all that remained over from chips from bars, about \$250. This seems a ridiculously small reward for such industry and tbrift. Still there are many others in similar positions who do not do as well, being able to increase their earnings during a year perhaps to the extent of \$1.00.

**

T— was foreman of the K— mine at J—. He had been there a long time and had never met with a serious accident. He had begun to believe that he was proof against them until one day while riding down on the skip he suddenly felt himself suspended in the air while the skip rolled on away down into the depths of the mine. His candle had gone out, but he knew what had happened. Some projecting object on the hanging side had caught in his jumper and "bung him up." For only a few seconds did he hang when he could feel the garment beginning to give, tearing away under his weight; suddenly it gave way, and as he swung around he frantically clutched at the timbers and succeeded in throwing an arm over a center brace. As quickly as possible he reached the bell line, stopped the skip, and rung the signal to hoist slowly. When the skip seemed to be about 50 feet below, T— clutched the greased rope and slid down to the skip and then rang to hoist. He went to the surface, thankful to be alive. Two or three weeks later his dark hair had turned to white.

**

When J— first became superintendent of the N— mine at S— he was anxious to have the whole world know it and never failed to tell whomsoever he might meet of his appointment to the position. He proposed to revolutionize things, too, and put in power drills. He was sinking a dry shaft, and the first round of bores had been put in and fired. I chanced to be idling, when J— approached me. "Doing anything in particular?" he inquired. "No," I replied. "Well, come up to the mine with me. I want to see how that round of bores broke. You know we are using machine drills now, since I have become superintendent."

We went to the mine and went down on the skip. No one on shift, the men had fired and gone, before supper. We stepped off the skip and slid down the timbers to the bottom. About half a skip load of rock broken.

"Guess they didn't shoot after all," said J—.

"Yes they did," I replied. "This is all freshly broken rock." We looked around and only the collars of a few of the bores were blown off. I looked

more carefully to ascertain the cause and found each of the dozen or more holes to have been pointed straight in. No "cut" holes, no provision for relief. All in 5 to 6 feet and not a hole broken. They would have to be burned out or cut holes drilled.

"Did you expect them to break put in this way?" I asked. "Cert," said J—, "Why not?" I explained my idea to him and he evidently saw the force of my argument, for I heard of no further trouble in that shaft on that score.

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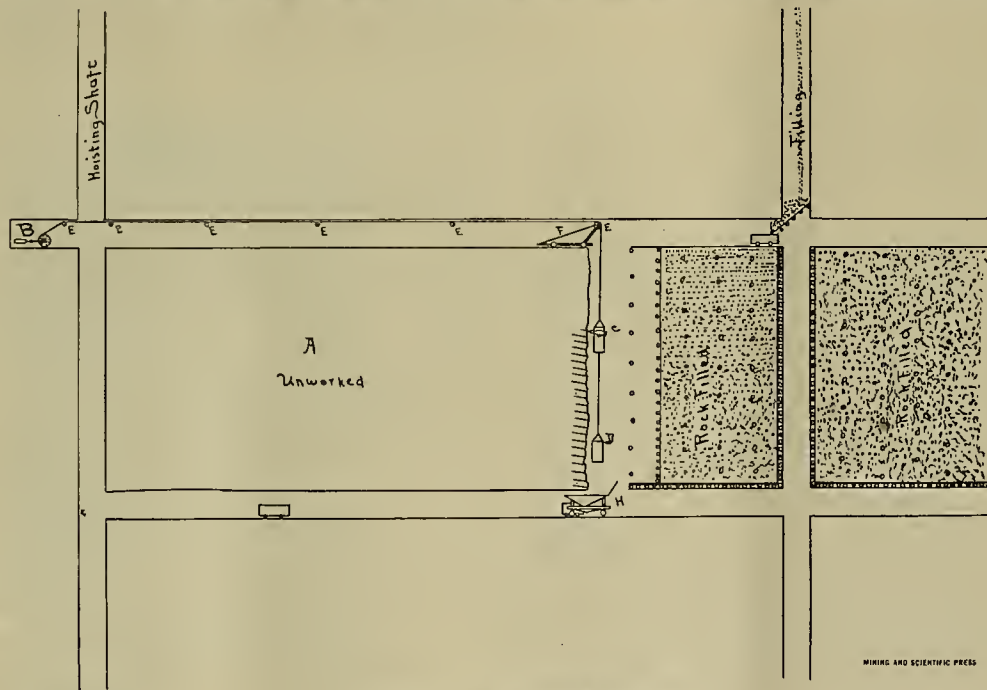
D— was an inventor. He had a deep, far away look, always dreaming of something. He dreamed one of the most ingenious devices for mining that for utter worthlessness it would be hard to beat. B— was a mining man with money. He met D— and a combination was formed. D— told his dream to B— and the foundry at A— got the benefit of it. They spent months in the construction of this strange and wonderful creation of D—'s. It was built and changed, altered and changed again, until it was pronounced complete. It was furnished with a good boiler and engine, had teeth and claws, was adjustable in every way, and the only unsolved problem was how to remove the rock which was to be torn down by this digger. It was taken to a mine near S— A— and set up in an open cut where a face had been carefully prepared for the beginning of operations. The rock was rotten amphibolite schist, that could be picked down with a sharp stick. The engine and its digging claws were set at work, but for some unexplained reason it would not do what was expected of it. The lowest limit of capacity had been set at 30 feet per day, but this machine did less than that, for it did not even do 1 foot and it cost several thousand dollars to learn this.

A Suggested Mining Method.

The following unique method of stoping and filling is suggested by a Colorado correspondent:

The drawing represents a vertical section of a portion of a mine in which the block of ore A between the levels is being worked out.

B is a small hoist with two drums on which are wound the ropes suspending the cages C and D.



Sketch Showing Proposed Mining Method.

These ropes are supported on pulleys E along the roof of level, the last of which pulleys is carried on a traveling derrick F whose boom projects sufficiently beyond the edge of solid ore to enable the cages to swing clear.

The cage C carries a horizontal drill-bar with ordinary lengthening device to allow of its being rapidly fixed between foot and hanging wall. On this bar are supported one or two drills according to width and nature of vein.

The cage D is used by the blasters and timbermen, and can be raised, lowered, or swung outwards from the face independently of C.

As the cages have little to carry beyond the men and their tools, they may be made of light weight. In the case of C, the cage is rather an appendage of the drill-bar than vice versa.

It might be described as a traveling bin from whose chutes the mine cars are filled. This bin must be made of strong material and always kept partially full to withstand the shock of falling rock. If preferred it may be dispensed with altogether and the rock filled by hand or steam shovel.

In order to protect the cages when hoisting the upper portion of the face, they must be hoisted up

to their pulleys and run back along the level. For this purpose, in order to avoid the necessity for excessive height in the level, the bottoms of the cages must be capable of being raised. This may be accomplished in a variety of ways as, for instance, by having the lower portion of cage suspended by chains from the upper.

The conditions best adapted for the successful employment of this method of mining minerals are: 1. Such a width between walls that stulls only are required for support. 2. Such a pitch as will cause the broken rock to run to a lower level. 3. At least fairly strong walls. 4. A practically regular pitch between levels.

The Use of Oil for Fuel.

TO THE EDITOR:—I have read the excellent article on the use of oil as fuel by the manager of the Selby Works. Regarding the use of oil as fuel for roasting in such localities as this, it may be said:

1. Roasting ores at inland smelters, where the ores are only concentrated into copper matte, either for converting at the same works or to be shipped to the refineries near the coast markets, is unnecessary when hot blast is used.

2. The cost of oil for fuel, either for roasting or under the boilers, is much more expensive than coal, at the present price for oil delivered here, due to the high freight charges made by the railroads. Yet I can not let the oil subject drop without saying a few words in its praise as fuel.

About the year 1888 the Florence oil wells of Colorado had accumulated a lot of residuum, left over after the lighter oils had been distilled off, for which they could only find a limited market until the American Smelting Works of Leadville, Colo., (then in charge of the writer), and the Henrietta and Maid Erin mines, also of Leadville, started to use this residuum as fuel under their boilers. The results were so satisfactory that the American Smelting Co. continued using oil as fuel under their boilers until the fall of 1893, and also used oil as fuel for their roasters, where the results were extremely satisfactory, due to perfect combustion, which enabled the men in charge of the roasters to obtain much lower sulphur assays from their roasted product than when

using coal; but by the time we began to appreciate the value of oil as fuel for roasting, the price had advanced, due to the increased demand, and the railroad company made us the concessions asked for in freight charges on slack coal, so that we did not continue to burn oil except under the boilers and in the lead hulsion concentrator—our partial refining furnace. We used steam with the oil burner as an atomizer at the boilers and refinery, but ordinary cold blast with the oil burners at the roasters, instead of steam.

Where oil can be obtained at reasonable prices, it is certainly a much better fuel than coal, and the results obtained in roasting furnaces or cupelling furnaces more satisfactory. S. E. BRETHERTON.

Val Verde, Ariz., Dec. 31, 1902.

MINERS may organize local mining districts and may pass laws not in conflict with the laws of the United States. The size of quartz locations cannot be made to exceed 1500 feet in length by 600 feet in width, nor can they compel a locator to take less than 1500 feet in length on the lode, but the width may be reduced to any reasonable number of feet on either side of the lode.

Method of Mine Sampling.

TO THE EDITOR:—I have noticed several articles in your journal discussing, pro and con, the best methods of making mining reports, whether on the gross or net value of the ores in sight, with the engineer's guess as to its availability for dividends and future work. This is a matter that, undoubtedly, every man will have to decide for himself, according to his own ideas and according to the wants of the men for whom he is reporting; but, possibly, a few suggestions on this subject will not be taken amiss. At any rate, these suggestions will do no harm, even if they do nothing more than produce some thought.

As a general proposition, the intending purchaser for whom the engineer is making the report knows nothing of the property whatever. He is absolutely without any knowledge of the conditions surrounding the property, and the things that may appear clear to one on the ground have to be explained in detail to one who is not on the ground. The engineer's best friend in making a mining report is the camera. It explains so much better, and without words, that which is so hard to convey in black and white.

Generally speaking, the value of a mine depends upon three things:

First.—The value of the ore per ton.

Second.—The number of tons exposed in the mine, with a guess as to what may be found in the future.

Third.—The expense of extracting its values.

As a starting proposition, the ore in the mine should be divided into three heads:

First.—Positive ore: That which is exposed on four sides, as, for example, a block of ground between two levels, with upraises in the ore connecting two levels.

Second.—Probable ore: That which is exposed on two sides, as between two levels.

Third.—Possible ore: That which is exposed only on one side.

The usual custom in determining these values is to take samples of not less than 100 pounds across the thickness of the streak, stating at the same time the thickness of the sample taken in feet and inches. This will give you the value, and, by determining the cubical contents of the block of ground, the number of tons may be approximately determined.

Then the following questions should be answered as nearly as possible. Of course, the questions to be elaborated will be determined according to the conditions of the mine:

1. Where is the mine located?
2. How many claims are upon the vein, and how many are located for purposes of protection?
3. How long is the vein, so far as known, on the strike, and who owns it at either end of the property?
4. What development is shown on neighboring property on the same vein that will give an index to the value of the property upon which the report is to be made?
5. What power for milling and mining purposes is available? If water power, give the distance from the mill or mine and describe it.
6. Answer the same question with regard to fuel, with cost at mine, whether wood, oil or coal.
7. What transportation facilities are there? This includes the kind of road, the state of the road or the same in regard to trails, with distance to markets or railroads.
8. What is the scale of wages paid for the different occupations?
9. Is the labor good, bad or indifferent?
10. Give an idea of the character of the country, whether rolling or precipitous, whether the mine would be worked by shaft, tunnel on the vein and crosscut, or if a milling proposition, state what disposition could be satisfactorily made of the tailings. This will include the question as to whether there are rivers near by and anything about the country that might be interesting.
11. Where is the nearest postoffice?
12. How thick is the vein from wall to wall?
13. Describe the character of both walls, the class of rock, with the character of the vein filling or gangue.
14. State whether the rock is hard or soft and the probable cost of development per foot, and if wall rock has to be broken or crosscuts made. State this separately.
15. How thick is the pay streak or streaks, with their distance from each other, if more than one?
16. What will the pay streak average as broken down? This means without sorting.
17. If it requires sorting, what percentage will be thrown out as waste?
18. What will the whole streak run in the different metals, giving each percentage by itself?
19. So far as known, will the pay streak be continuous, meaning by that, one in which all the development would be done upon ore?
20. Is the streak lumpy, or does the ore come in shoots, with waste rock in between? Give full description on this point.
21. What work has been done on the vein with stopes, and the production of each, so far as possible?
22. State the class of reduction to which the ore

is susceptible. If ore is extracted at mine, state percentage of recovery and cost per ton. If of a smelting nature, give the rate of treatment accorded by the smelter, and railroad and wagon freight.

23. Is the vein wet or dry?

24. If wet, state the amount of water in gallons per minute, and state if the water is at all acid in nature.

25. Is the mine being worked at present? If not, why is the property idle?

26. In sending maps, send both maps on plan and vertical elevation, showing the contour of the outcrop.

27. In giving assays, give all assays taken, whether good or poor, even those on waste rock.

28. Are the titles clear or clouded?

29. Does the ore change in character or value as depth is gained from the surface?

30. Give the past production of the mine in dollars and cents, as well as the percentages of the different metals and price received at time of sale.

Silverton, Colo., Dec. 27, 1902. S. I. HALLETT.

An Experience in Drift Mining in Hard Cement Gravel.

NUMBER II—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by L. H. CARVER.

EQUIPMENT AND METHOD OF SAVING GOLD.—The next important feature, after determining the presence of gold in paying quantities, and opening up sufficient ground to develop, as far as possible, the extent of the pay, is to determine the best method of saving it.

We will not attempt to describe the various ways by which this is accomplished, under the different conditions where drift mining is carried on, but will confine this article to a description of this particular plant, which has successfully handled the material and produced satisfactory results.

At present the gravel is hoisted in an iron bucket, but it is our intention to put in a skip, which will obviate the necessity of a man to land it, and require occasional attendance only.

From the time the gravel is loaded into the bucket from the bin, in the sump at the main shaft, and hoisted, it is carried by gravity to the mill and requires no further handling, the material being dumped on the grizzly, drops into a large bin directly underneath, from which a short chute, controlled by a gate, allows it to pass to a Challenge automatic feeder and then into the mill, from which the pulp, after flowing over the table, is carried into the tailings flume and discharged into the gulch.

A 5-stamp mill is used to crush the cement, which is quite hard and compact, the stamps weighing 900 pounds and dropping 5 inches about ninety times a minute, which seems to give the most satisfactory results; the discharge is kept at about 4 inches, by chuck blocks of varying heights, and the screen used is the ordinary steel wire cloth, with five holes to the inch. A larger quantity of water is turned into the mortar than is customary in quartz milling, and carries the pulp onto the table as soon as reduced to the required fineness.

The battery water is taken from the tail-race, after passing the water wheels, and was frequently found to carry oil on the surface (drippings from the various machinery under which it passes); to prevent this oil from reaching the mortar the battery water box or launder from the tail-race was dropped 2 inches below the main flume, and a strip of wood inserted, acting as a weir in the tail-race, and raising the surface of the tail water sufficiently above the aperture to the battery water flume, which is also controlled by a gate, to carry off all impurities and prevent their being drawn into the mortar.

The sectional drawing, Fig. 3, shows the manner in which this was effected.

After passing the screen the pulp flows over a wooden table, the full width of the mortar and 10 feet long, set to a grade of $1\frac{1}{2}$ inch per foot.

This table is built with 2-inch smoothly dressed sugar pine planks on the bottom, the width of the planks being such that only one joint was necessary, the sides being 6 inches wide or high.

I am reminded here of a method to secure an absolutely water-tight joint, where the contact edges are of considerable length, that was suggested to me by the head carpenter at a large hydraulic mine in southwestern Oregon, where I was engaged in designing and installing the plant, several years ago, and has since been used by me with very satisfactory results. It was a new one to me and may be of interest to others.

Dress the edges of the planks which are to form the joint to an even contact; set one of the planks on edge, and with a short piece of round iron—the end of which is bent up about 90° to enable one to hold it in position— $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter, make a continuous groove along the center of the edge of the plank, by sinking the rod into the wood by striking with a hammer; then dress the edges down again evenly to the bottom of the groove thus made, and fit the joint together and securely fasten in place.

The compressed fibres along the groove, upon wet-

ting, will swell out against the edges of the adjacent plank, making a joint that will not only be water-tight, but will successfully resist a very considerable steam pressure, if used in that connection; it being

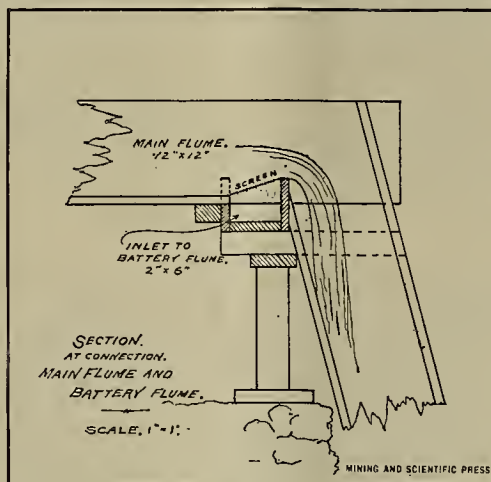


FIG. 3.

understood that such a joint is to be used only where the planks can be securely tied together with iron rods.

Continuing with the original subject, across the bottom planks of the table and at right angles to the flow, were cut four channels, $1\frac{1}{4}$ inch deep and $2\frac{1}{4}$ inches wide on top, and shaped accurately—as shown in the cut—to a template; the distance between channels being gradually diminished, approaching the lower end. (See Fig 4.)

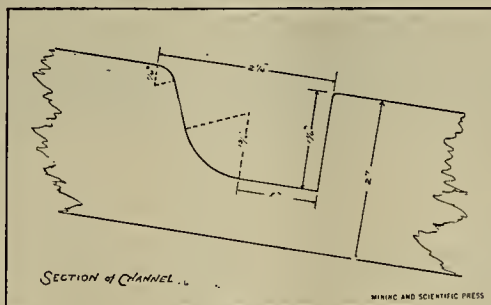


FIG. 4.

In operation, the action of the pulp and the results were admirable, a continuous roll taking place at each channel, where the pulp was turned over and over before escaping.

Quicksilver was fed into the mortar at regular intervals, and the last channel on the table was kept fully charged also; the three upper channels, however, received no "quick" except that accumulating from the pulp, and the uppermost one required cleaning up every day, a string of amalgam as large as one's thumb remaining here after the day's run.

The other channels were left with their accumulations of amalgam until the run was completed.

From the table the pulp dropped into a launder across the end, and from which it passed through an amalgam trap, constructed with three partitions in a square box, being similar to a short section of a cyanide precipitation box, and thence into the tailings flume, which was provided with nests of riffles at intervals in its length, and served to arrest any quicksilver that escaped from the trap.

No copper plates were used, the greater part of the gold being quite coarse and heavy, and the fine gold escaping the upper channels being caught in the last channel, the results showing a very close saving as compared with the sample values, taken at regular intervals at the feeder, it being estimated that a little over 90% of the gold contents of the gravel was gathered from the mortar and the table, of which the mortar furnished approximately 23%; first channel, 32%; second, 18%; third, 10%; fourth, 15%; and the amalgam trap and riffles, 2%.

The wide difference in the saving between the mortar and table is due to the low discharge, large screen mesh, and the quantity of water admitted to the mortar.

There is considerable "rusty" or "red" gold, which is also saved on the table, and gathered up separately, as it refuses to amalgamate until rubbed in a pan, to remove the coating of iron oxide.

The general character of the gold is the smooth washed, clean, channel variety, varying in size from "flour" to pieces weighing 50 cents, all of which yields readily to amalgamation, and a few nuggets have been found valued as high as \$3.25.

Under the conditions as stated, the mill is capable of handling from forty to forty-five tons per day, and the cost of mining and milling was found to be between \$1.30 and \$1.40 per ton, with material that will average, in actual work, about \$2.25 per ton,

but considering the fact that the gravel extracted so far has been taken from an overflow it augurs well for the values to be obtained in working the channel proper and the future productiveness of the property.

The entire plant, it may be said, is operated by water power, 2600 feet of 11-inch pipe, under a head of 185 feet, about 40 miner's inches being required for the hoist, mill and two pumps.

Some further changes and improvements are contemplated, however, that will effect a greater economy in handling the material, and, it is also hoped, a greater saving of values.

A Study of Amalgamation Methods, With the Object of Avoiding the Loss of Mercury.*

NUMBER IV.—CONCLUDED.

By MICHAEL BUSTAMANTE, JR., M. E., City of Mexico.

The two principal signs observed in the usual tests which have hitherto served, and will doubtless continue to serve as a practical guide in the operation of the patio process, confirms part of the theory here presented.

1. The test of a "cold" torta, made immediately after the incorporation by trampling, shows mercury, sometimes in part more or less confluent, but usually in small drops, or the exceedingly fine state of division (floured) which we call *liz*. Rubbing this together and then attempting to strain it by squeezing we obtain scarcely any signs of amalgam. The mercury is very white, resembling its natural color, or tending more or less to a yellowish color on the surface, owing (as experts say) to the formation of sub-oxide of copper. The film of this oxide, covering the surface of the mercury, is undoubtedly due to the decomposition of the chloride of copper by the oxides of iron in the ores; and the quantity of chlorine thus liberated from the copper salt is not sufficient to form the needed amount of perchloride of iron, which, acting in the nascent state and favored by the heat liberated in its own formation, is the true agent in the chloridization of the silver compounds. Hence the "coldness" of the torta, with the unfavorable conditions which that implies. This phenomenon led me to suspect for the first time the important part played in the patio process by the iron oxides and salts of the ore.

2. On the other hand the torta is "hot" when an excess of sulphate of copper has been added. In this case, perchloride of iron is very rapidly formed and tends to be reduced with similar rapidity to the proto-chloride, converting the mercury to calomel (Hg_2Cl_2), until the reaction provoked by the immoderate use of sulphate of copper has terminated. In this case, practically all the reagents employed are consumed in the chlorination of the mercury without useful result. The greater part, if not the whole, of the iron oxides in the ores is changed to proto-chloride; and if, after the overheated torta has cooled, pure sulphate of copper be employed to continue the treatment, much difficulty will be experienced in recovering the conditions lost.

Inventors, reasoning upon the reaction of the Freiberg harrel amalgamation, have proposed the use of metallic iron in the various phases of the patio process, as a means of minimizing the loss of mercury. The main result of such a measure has been the requirement of a larger quantity of sulphate of copper, together with delay in the progress of the treatment. The reason is easily seen—the metallic iron precipitates metallic copper and this reaction cools the torta. The consumption of mercury increases instead of diminishing.

In view of these facts and considerations it is, in my judgment, the best practice to conduct the treatment of the torta moderately and with vigilance and upon the least sign of excessive heat to apply the remedy at once in the form of a quantity (calculated as exactly as possible) of lime, precipitated copper, or ashes, to forestall the effects of a "hot" torta upon the mercury, as is the case when the torta is hot.

As already observed, the proper amount of sulphate of copper required in this process for any particular ore should be as carefully determined, according to the law of chemical equivalents, as the amount and nature of flux required in a smelting process. And it follows that for this process, as for smelting, different ores might be so mixed, after proper analysis of each, as to diminish the necessary amount, or increase the effectiveness of the metallurgical reagents added. Empirical mixtures of "docile" and "rebellious" ores are known to have given excellent results in many Mexican localities; and there is a wide and promising field for the thorough study and systematic application of this practice, which would raise it from the plane of local tradition or happy accident to that of definite purpose and foreknowledge.

In this, as in other respects, the Mexican amalgamation process has never had opportunity to exhibit its full technical and economical capacity. I firmly believe that it can successfully compete with smelting, especially in a country like ours, in which, by

*Transactions Am. Inst. Min. Eng.

reason of topographical conditions and the cost of fuel, freight will always be high.

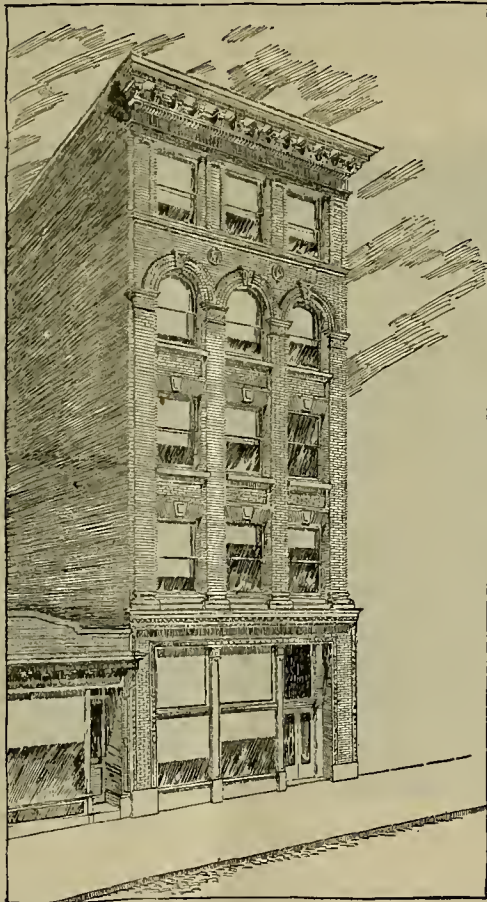
With regard to methods for diminishing the loss of mercury and amalgam, I would here recall the experiments in connection with the amalgamation of gold, described in the first part of this paper. I have similarly employed the electric current in connection with the patio process also—not to affect the treatment itself, but to join the metallic particles. The result was, as I had expected, the same as that which had been accomplished with gold. The quantity of silver and mercury recovered was considerably increased; and I succeeded in saving 97% of the humid-assay value of silver with a loss of only 5.1% of the mercury employed.

The apparatus consisted of a series of amalgamated copper plates connected to the poles of the dynamo and grouped in tension, so as to obtain, per square meter of surface, from one to two volts and forty amperes of current. These plates were so suspended by means of the canals and inside of the drain of the patio in such a manner as to interrupt, to a certain extent, the free passage of the slimes and water, but without seriously hindering or complicating the washing of the torta. I am fully conscious that, after more than seven years spent in establishing facts, overcoming difficulties and perfecting details, my work in the economic utilization of the facts and theories set forth above is, like my attempt to state them here, still far from complete and satisfactory. Nevertheless, this paper, begun two years ago, is now published, in the hope that the suggestions and experiments of others may aid in the improvements and the due recognition of our Mexican patio process, so little understood, so often undervalued and so worthy of a better fame and fate.

The New Home of the Paraffine Paint Co.

The Paraffine Paint Co. will move into their new building at No. 24 Second St., San Francisco, Cal., about Feb. 1, 1903.

So popular have become the P. & B. products and the demand for them has grown so rapidly within the past years that the company has recently added to its factory equipment in Paraffin, Alameda county, Cal., and now intend to increase their office and salesroom, to meet the demands of this increased



New Home of Paraffine Paint Co., San Francisco, Cal.

business, by occupying the three lower floors in the handsome new structure built for them.

This building is centrally located, being within a few steps of Market street and just within a half block of the Palace and Grand hotels. The floors are 26 feet wide by 90 feet in length and are connected by freight and passenger elevators.

The street floor will be used as main offices and sample room, while on the other floors a good-sized stock of ready roofing, building papers, paints, etc., will be carried for the San Francisco trade. Out-of-town orders are shipped direct from the factory.

The Paraffine Paint Co. have been located at No. 116 Battery St., San Francisco, Cal., for the past sixteen years.

The Mining Industry of the Cœur d'Alenes, Idaho.*

NUMBER II.

By J. R. FINLAY, Colorado Springs, Colo.

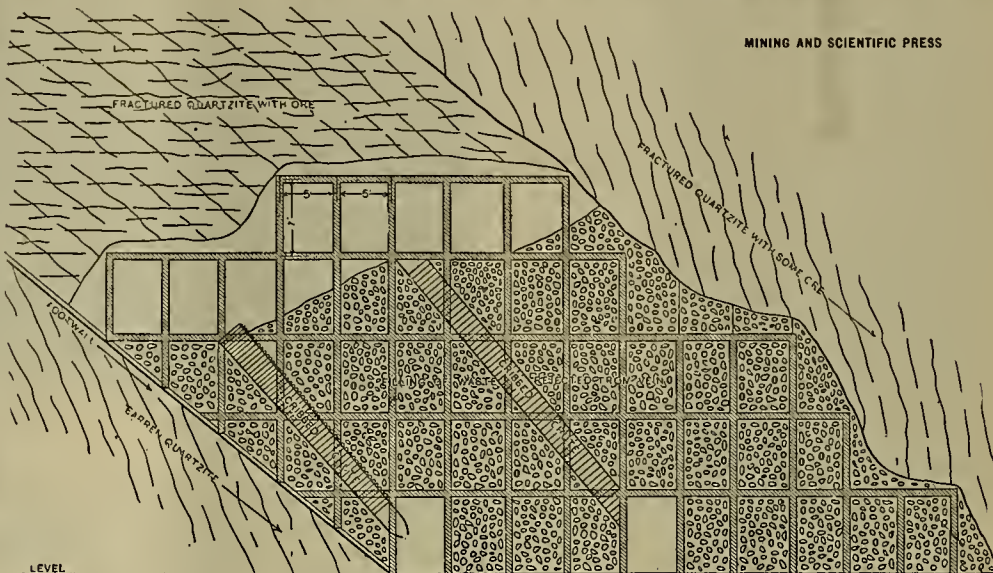
METHODS OF OPERATION.—The mining industry of the Cœur d'Alenes may be divided into three departments: 1. The extraction of the ore from the ground, or actual mining. 2. The concentration or milling, which, at every property in the district, with two exceptions, includes transportation of several miles from mine to mill. 3. The shipment and sale of the concentrated ore.

In general terms, there is a loss in concentration of from 20% to 30% of the gross values, and the

nearly of the same depth, 2000 feet or more.

These three mines are equipped with Corliss hoisting engines of the same make and size, which were made by Fraser & Chalmers, with 20x60-inch steam cylinders, flat ropes and reels, designed to hoist as much as 2500 feet. They can be run with or without counterbalance.

No mechanical devices of special interest are peculiar to the district, with the exception of an electric light hoist signal system, recently installed at the Standard mine. It is possible that this device may in time become more widely known and extensively used. It consists of a signal box in the hoisting room and at each station in the shaft. Electric lights are placed in these boxes behind ground glasses, on which are marked the desired signals. Switchboards placed near the boxes enable the station tenders to turn on the signal lights, which burn until they are turned off by the engineer with a throw-out



Timbering and Filling Stope, Bunker Hill & Sullivan Mine.

freight and treatment charges amount to 40% of the gross selling price of the concentrates, leaving the mine owner from 42% to 48% of the gross value in the ore to cover the cost of mining and milling.

For example, I have said above that the ores mined in the district would average by assay about 10% in lead and seven ounces silver per ton. The lead and silver are sold to the smelters say at "brokers' quotations," the smelter paying for 90% of the lead and 95% of the silver in the ore. At present prices the gross value of the above mentioned ore would be:

90% of 200 lbs. = 180 lbs. lead, at 3.5 cents.....	\$6.30
95% of 7 ozs. = 6.65 ozs. silver, at 55 cents.....	3.66
Total.....	\$9.96

Of this total gross value, after deducting concentration losses and freight and treatment charges, the mine owners' residuum of 42% to 48% amounts to from \$4.20 to \$4.80 per ton. The cost of mining and milling will be, under varying circumstances, \$2.50 to \$3.50 per ton, and the net profit remaining will be, therefore, from \$0.70 to \$2.30 per ton.

MINING.—At least 70% of all the ore thus far mined in the Cœur d'Alene has been extracted through tunnels, without hoisting or pumping. Of the remaining 30% which has been hoisted, at least two-fifths has been hoisted through underground shafts, to be subsequently hauled out through tunnels. The Tiger-Poorman is the only mine which has always been operated by shafts from the surface. This large proportion of tunnel work has been a great advantage to the district.

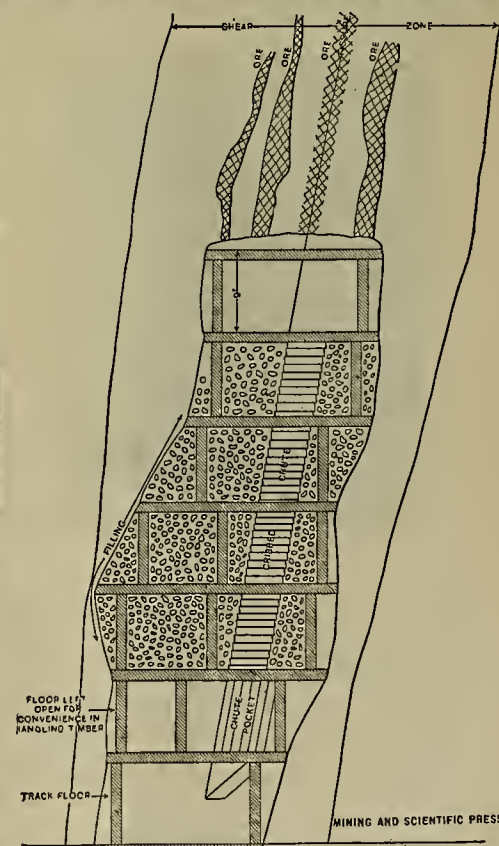
There are many long and well-constructed tunnels, designed to serve for the final exploitation of the mines. The principal ones are: The Sweeney (Wardner, about 5000 feet long); the Reed (Wardner, about 5500 feet); the Kellogg (Wardner, about 12,000 feet); the Frisco (Gem, about 1200 feet); the Standard (Mace, about 3000 feet); the Mammoth No. 6 (Black Bear, about 3600 feet); the Hecla No. 3 (Burke, about 2400 feet); the Morning No. 5 (Mullan, about 3000 feet); the Morning No. 6 (Mullan, now being driven, 10,000 feet).

Each of the mines operating the above tunnels has a number of other adits, some of them of great length; but these are of earlier and less elaborate construction, and serve for the working of upper levels.

The principal shafts of the district are the following: The Tiger-Poorman (sunk from surface 1700 feet); the Hecla (300 feet); the Standard (in Campbell tunnel, 3000 feet from the surface and 850 feet deep); the Frisco (in Frisco tunnel, 1200 feet from surface and 1400 feet deep).

Measured vertically below the outcrops, the Tiger-Poorman, the Standard and the Frisco mines are

device. The chairs for landing the cages in the shaft are provided with an attachment which, when the chairs are thrown out to receive the cage, automatically turns on, in plain view of the engineer, a warning light, marked with the number of the level at which the chairs are out. The signal lights burn both in the stations from which the signals are given



Timbering and Filling at the Standard Mine.

and in the engine room. This enables the station tender instantly to see and correct any false signal. It is practically impossible for the engineer to receive a false signal, and, as he knows the exact position of any chairs which may be out in the shaft, there is no excuse for smashing cages.

Three methods of mining are used in the district: 1. Back stoping and timbering. 2. Back stoping,

*Trans. Am. Inst. Min. Eng.

timbering and filling. 3. Back stoping and filling without timbering.

At the Bunker Hill & Sullivan the most interesting feature of the underground mining is the extraction of wide bodies of low-grade ore by stopes which are filled, as the work progresses, with waste rock sorted from the broken ore. There is usually more than enough of such material to keep the stopes full, and provision has to be made for tramping the surplus waste away. Sometimes this hack stoping is done without any timbering other than an occasional prop to support a suspicious looking piece of ground in the roof; but more commonly the stopes are timbered with light square sets. (Fig. 7.)

In stoping the ore at the Standard (see Fig. 8) it has been found necessary to fill up the stopes with barren material from the vein. This is done by the simple process of sorting out part of the waste rock from the barren streaks and from the walls, and throwing it down among the timbers below. It is easy, in most parts of the mine, to secure in this way enough filling to keep the stopes full within two or three floors of the hack. As the levels are 200 feet apart, it is necessary to build massive cribbed chutes up through the timbers.

The timbers are of two kinds, square sets and stull sets. The square sets are 9x5x6 feet, and are built in the usual way. The stull sets are merely caps, cut, if possible, long enough to reach from wall to wall, set horizontally and supported by two posts. If the vein is over 15 feet wide the cap is made in two sections, joined together on a third post. Three-inch plank is used for flooring or lagging.

The timbering has always been massive and elaborate. Only the abundant supply of cheap timber, which is one of the advantages of the region, renders such heavy timbering economical.

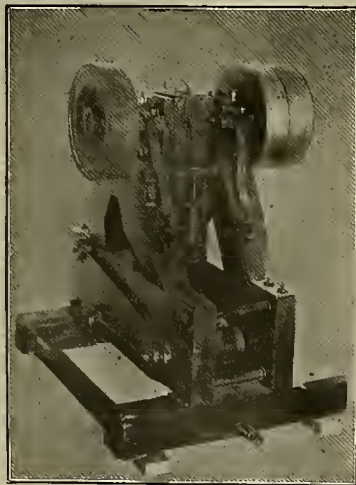
Every facility is provided for the easy handling of the timbers inside and outside of the mine. Each level is equipped with two good hoists, operated by compressed air, to hoist the pieces into the stopes. To provide for these hoists and for the ropes and sheaves, the first floor above the track floor is left open and free from filling.

(TO BE CONTINUED.)

Wallace Steel Crusher.

The Wallace sectional steel crusher illustrated herewith is stated to have a daily capacity of from twelve to thirty-six tons. The parts subject to the hardest wear are made of steel to resist a strain of 120,000 pounds. As there is no strain on the framework, it is made of iron or wood as desired.

The vertical lever or crusher bar is built up with 1x7-inch steel bars. The bars are separated by hard-wood timbers of sufficient thickness to bring the lever to required width, bolted so as to bring the strain edgewise on the steel bars. The crusher bar



Wallace Steel Crusher.

has both a vertical and lateral motion. The movable jaw or crushing plate is attached to the lever. The jaw is held in place by means of a clamp at top of jaw. The jaws can be taken up 1 inch by an adjustment and designed to still retain the same degree of fineness in the work. The crusher is provided with a safety or breaking pin. Should a foreign substance get into the crusher, this pin will shear off and allow the movable jaw to drop back and permit the obstacle to pass through without injury to the machine. The bolt can be easily replaced. The mill is designed for crushing and pulverizing of rock, clay, cement, graphite, or anything else desired to crush. It can be adjusted from $\frac{1}{8}$ to $\frac{3}{4}$ of an inch. It is designed to be well adapted to a jig proposition, with intent to prepare the material for the jig without any further crushing machinery, and is intended to work equally as well on wet or dry material. Each mill is provided with one loose pulley and two fly wheels, one of which serves as a driving pulley. This crusher is manufactured and for sale by Chas. Wallace, 1420 Market street, Denver, Colo.

The Hendrie & Bolthoff Establishment.

The Hendrie & Bolthoff Manufacturing & Supply Co., for the past thirty years manufacturers and dealers in mining machinery and supplies, Denver, Colo., has recently moved into their new building 17th and Wyncoop streets, opposite the Union depot, Denver, Colo. The building has been remodeled to

light and handsome exhibition room. The gallery extending around this floor is also used for exhibiting machinery.

On the second floor is the private office of the president of the company, Mr. E. B. Hendrie. On this floor also is a commodious drafting room and large fire-proof vault for filing drawings. About one-half of the second floor is occupied by fine tools and machin-



The New Building of the Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

meet their requirements. It is built of red pressed brick and is 125 by 150 feet, four stories and basement, giving them approximately 100,000 square feet of floor space. The cellar extends under the entire building and is used for the storage of heavy pipe fittings, of which they carry about 100 carloads in stock. To handle goods economically they have put in a hydraulic elevator in the basement to the ground floor and an electric elevator from basement to fourth floor, in addition to which they employ an electric passenger elevator.

The rear of ground floor is devoted to the shipping

ists' supplies, which are all kept in cabinets built for this purpose. The remainder of this floor is taken up with brass goods, valves and mining screens.

The third floor contains helting, hose, packing and rubber goods, etc. A large space is allotted to shovels, several carloads being carried in stock. On this floor the firm has fitted up a large room with tables and chairs for the use of its employees as a lunch room.

On the fourth floor they carry a large stock of Dodge wood pulleys, arranged on racks, jack screws, pumps, gasoline engines and other material. They



An Interior View of the Hendrie & Bolthoff Mfg & Supply Co.'s Establishment, Denver, Colo.

department, a portion of the space being arranged to permit of the wagons driving into the building and loading under cover direct from the shipping platform. The orders are assembled on benches and each order checked by two men to avoid errors before being loaded for shipment. The shipping facilities are excellent, having as they do railroad tracks on both the east and west sides of their building. This gives them special advantage in the economical handling of both incoming and outgoing shipments.

The offices are handsomely fitted up and occupy about one-third of the ground floor space. The remainder of the space on this floor is entirely devoted to displaying purposes and at the present time shows one of the largest displays of mining and milling machinery ever placed on exhibition in a sales room. An open court extending to the second floor makes a

have an electrical repair shop where the firm makes its own switch boards and does its own electrical repairing. They intend also putting in a large stock of electrical supplies.

They have four large warehouses, having a combined floor space of 150,000 square feet, situated on the railroad tracks, in which are stored the heavier machinery and supplies, sheet steel, pipe, rail, boilers, engines, concentrators, compressors, hoists and electrical machinery.

The firm report greatly increased business since occupying their new quarters. The officers of the company are: E. B. Hendrie, president; H. Bolthoff, vice-president; C. F. Hendrie, treasurer; H. P. Waterman, secretary. The accompanying engravings give a good idea of the appearance of the establishment.

Fifth Annual Report Lincoln Mine.

The fifth annual report of E. C. Voorheis, superintendent of the Lincoln Gold Mining Co., Sutter Creek, Amador county, Cal., dated Jan. 5, 1903, is at hand, and is in part as follows:

On May 24th we completed sinking the main shaft to a depth of 2000 feet. Fifteen feet above the bottom of the shaft we drove a crosscut into the footwall 81 feet, 10x12 feet in size, to increase the capacity of the sump. At a point 1950 feet from the surface we cut a station and chute, which we call the 1950 level. The chute will hold 100 tons. This work was completed by June 30th.

DETAILED STATEMENT OF COST OF SHAFT SINKING.—Following is a detailed statement of cost and time required to sink the Lincoln shaft 740 feet, from 1260 feet to 2000 feet. The size of the excavation is 8x17 feet. Material encountered in sinking, greenstone and hard black slate.

The labor cost of sinking and putting in timbers was as follows: It required 3864 holes drilled in the bottom of the shaft, or 5 2 per foot of shaft, which took—

2956 days' labor at \$2.75 per day.....	\$7,129 00
One day foreman, 350 days at \$4 per day.....	1,400 00
One night foreman, 282 days at \$3.25 per day.....	916 50

Total cost of sinking 740 feet and putting in timbers..... \$9,445 50

Labor cost per foot for sinking 740-foot shaft..... \$12 76

12,450 pounds Hercules powder were used, costing..... 1,307 25

Cost of powder per foot of shaft..... 1 76

Amount of powder used per foot of shaft, 16.8 pounds..... 125 30

35,800 feet of fuse were used, costing..... 17

Cost of fuse per foot of shaft..... 17

Amount of fuse used per foot of shaft, 48.4 feet..... 46 00

Forty-six boxes of Lion caps were used, costing..... 06

Cost of caps per foot of shaft..... 06

2400 pounds of candles were used, costing..... 288 00

Cost of candles per foot of shaft..... 39

Three and two-tenths pounds of candles were used per foot of shaft.....

148 sets of timbers were put in place, requiring 207,200 feet of lumber at an average cost of \$18 per M..... 3,729 60

Cost of lumber per foot of shaft..... 5 04

Amount of lumber used per foot of shaft, 230 feet.....

Total cost of labor, lumber, light, blasting material..... \$14,941 65

Cost per foot for labor, lumber, light, etc..... \$20 19

Total cost of labor for engineers, blacksmiths, framing timbers, and skip tenders..... 6,224 00

Cost of top expense per foot of shaft..... 8 41

Total cost for fuel for sinking 740 feet..... 5,893 50

Cost of fuel per foot in sinking 740 feet..... 7 96

Total cost of sinking shaft, including all expense except office expense..... \$27,059 15

Total cost per foot of shaft..... \$36 56

During the time the shaft was being sunk 60,025 tons of water were hoisted.

9456 tons of waste were hoisted from the bottom of the shaft to the surface, making a total of 69,481 tons hoisted.

COST OF RUNNING LEVELS AND CROSSCUTS.—The following is a detailed statement of the cost of running 1175 feet of drifts and crosscuts on the 1950 level. Most of the rock was hard greenstone:

1428 days labor (miners at \$2 75 per day and car men at \$2 50 per day) amounting to..... \$3,772 50

168 days for day foreman at \$4 per day..... 672 00

134 days for night foreman at \$3.25 per day..... 435 50

Total labor cost for drifting and crosscutting 1175 feet..... \$4,880 00

Average labor cost per foot..... \$4.153

11,150 pounds of powder were used, costing..... 1,226 50

Average cost of powder per foot..... 1.043

26,500 feet of fuse were used, costing..... 79 50

Average cost of fuse per foot..... .068

Thirty-five boxes of Lion caps were used, costing..... 35 00

Average cost of caps per foot..... .03

800 pounds of candles were used, costing..... 96 00

Average cost per foot for candles..... .082

Total cost per foot..... \$5.376

Total cost..... \$6,317 00

3258 blasting holes were drilled.

Average number of holes drilled per foot, 2 77.

The average amount of powder used for each blasting hole was 3 42 pounds.

Average amount of fuse per foot, 22 feet.

Average number of caps per foot, 3.

Average amount of candles per foot, 68 100 pound.

Average size of tunnels, 5x8 feet.

Following is a detailed statement of the work done at

the mine from January 1st to December 31st, 1902:

16,103,400 gallons of water were hoisted from the mine during the year; 10,487 tons of waste were hoisted; 77,592 total tonnage hoisted from the mine during the year; 4547 blasting holes drilled; 16,250 pounds of dynamite used; fifty-six boxes of Lion caps used; 41,100 feet of fuse were used; sixty-three 40-pound boxes of candles used; 4047 barrels of oil were burned for fuel during the year; the compressor ran 2782 hours; the engineer made 41,797 trips with water, waste, timbers, etc. All buildings, machinery and tools are in good condition. Rainfall from January 1 to December 31, 1902, 24 68 inches.

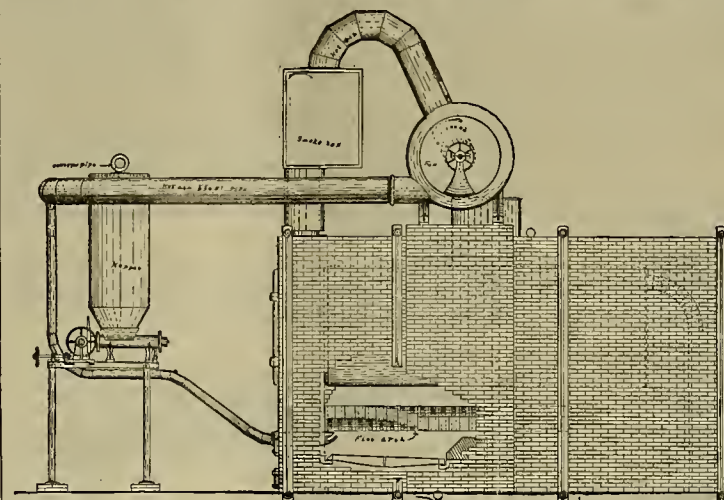
Total disbursements since organization of the company, \$197,951.06.

E. C. VOORHEIS, Superintendent.
Sutter Creek, January 5, 1903.

New Coal Dust Burning System.

Written for the MINING AND SCIENTIFIC PRESS by C. O. BARTLETT.

We have perfected and put into practical operation a system for burning soft coal which we believe is worth the careful consideration of all users of soft coal. By this system we get a perfect combustion—in other words, no black smoke; a saving of 25% in the amount of coal used; no cinders at all and scarcely any ashes. It requires no change in the grates used under any ordinary boiler to install this system, and in case of accident coal can be fed at the



Rowe Feeder System.

furnace doors the same as before. The supply of feed can be changed at a minute's notice by simply turning a hand wheel. The doors are not opened at all, thus doing away with all undue contraction and expansion caused by the admission of cold air through the furnace doors as in the old way of firing. No fireman is required.

The writer maintains that to get perfect combustion three things are necessary: The coal must be of uniform size; it is impossible to get the same results from burning a chunk of coal as big as a man's head and another piece as big as a pea. The coal must be made of even size before perfect combustion can be had.

The coal must be of equal moisture; the same result cannot be obtained from burning coals of different moisture. Run of mine coal containing 5% to 6% moisture will not give the same combustion as slack coal containing 10% to 12% moisture. The idea of wetting coal before putting it in the furnace or admitting steam jets under a boiler is nonsense.

Powdered coal must be burnt in suspension. If it is swept or pushed into the furnace the heavy particles will fall to the bottom and become a solid clinker, which is objectionable and almost impossible to get out, but by burning in suspension absolute combustion is obtained.

With these three important features in view we have perfected and are now using under our boiler at Cleveland, Ohio, a system by which we first dry the coal, using the cheapest kind of slack coal and drying it down to 2% moisture, then grinding it down to eighty-mesh fine, which makes it practically coal dust. We then use what is known as the Rowe feeder system, which is described as follows, accompanied by drawing shown: The ground coal is stored in an iron storage hopper or tank above or near the boiler. An air pipe, "A," is connected with feeder spout at the furnace and above the boiler in the breeching or stack, a blower fan is attached to this pipe of sufficient size to furnish the necessary air for burning the coal dust. The operation is as follows:

The coal is conveyed by a special conveyor from the bottom of the storage bin to a spout, "B." The speed of this conveyor controls the amount of coal used and can be changed at a moment's notice by turning a hand wheel, that is, to feed faster or slower according to the amount of fuel desired. From the conveyor the coal is fed direct to the air spout, "A." There is a nozzle, "C," on the inside of the air spout which concentrates the air just as it strikes the coal as it comes down from the conveyor, which gives a thorough mixture of the coal with the

air and at the same time prevents any danger of clogging. The coal is caught by the current of air and blown along the air spout to the furnace spout. Just before entering this spout there is another nozzle, "E," which again concentrates and mixes the air with the dust just before it enters the feed spout, "D." This feed spout is made of cast iron and has a semi-circle opening or mouth so as to spray the coal dust up and against the arch wall, where it is ignited and burned in suspension. This spout is covered with firebrick for protection, and the current of air continually passing through it also protects it from burning out. In fact, there is nothing about this system which is not very durable, and this we consider a very important feature in any system. There are slides or valves on the different places in the air pipe so as to admit just enough air to get perfect combustion, all of which are under the complete control of the operator.

A Shift in the Mill.

Written for the MINING AND SCIENTIFIC PRESS.

"How're they stacking up, old man?" I remarked to my partner coming off shift. "Rotten, Jim, rotten! I've had a lively old night of it—broke a shoe in number eight, two feeders on the bum, tappets slipped in three and ten, and two or three screens

broke. The ore has been low and the feeder man had to be in the ore bin half the time picking down; then lazy Jack down there on the concentrators went to sleep after eating his lunch and let his sulphuret boxes run over. You'll find the plates in pretty good shape; but I guess you'll have to feed a little more, silver, as they're sending us some rock from the 1650. Well, so long, Jim; hope things don't buck as hard with you." "So long, Bill; this is good weather for you night men to sleep."

After changing my clothes an examination of the plates shows they are getting thick. As Bill had remarked they are sending us some of that buncy rock from the 1650. The helper having things ready we start to dress the plates. Looking down on the lower floor, the vanner man seems to be cussing about something. Oh, yes, one of those old worn out belts has broken and he's trying to patch it up. Super says the stockholders are howling for dividends, and it's pretty hard to get new things in a hurry. Well, by the time we have gone over the plates of the whole sixty, and the amalgam cleaned and squeezed out, it is nearly 9 o'clock.

Going down to the safe to lock up the amalgam, I hear a lively hammering, and look around to find that the feeder tappet on number six has slipped. Catching sight of Henry sweeping up, I hold up six fingers. He runs upstairs, hangs her up, and sets the tappet.

"Henry," I said, after making a round to feed "silver," "just keep an eye on the batteries while I take Jim's report over to the office, and stop at the blacksmith shop to have this tappet key drift fixed up." Returning, who should be looking for me but my old partner, Jack Winkle. You know, about five years ago, Jack and I run the little 10-stamp mill, opposite shifts, at the Howling Coyote, down near the desert, and this is the first time I've seen him since. Well, sir, he is now on his way to British Columbia to take charge of a 40-stamp mill. Making a round of the batteries, and finding things going along all right, Jack and I sit down on some timbers outside the door and have a chat over old times. He has been working at Jackass gulch, about 10 miles back of us here, for the past six months, and neither of us knew the other was so near. As the whistle blows for noon he starts down the road toward the hunk house to catch the stage. Well, I guess I'd better eat my lunch.

My ears tell me that some of the stamps are not hitting right, and glancing out I see the feeder man hiking down the line with a piece of bread and meat in hand and his jaws working vigorously. He stops at number nine and changes the feed, and soon the stamps resume their steady roar. Lunch being over, the first thing in order is to set the tappets on four and seven—the drop is getting too long.

First thing I know here comes the feeder man with a worried look on his face: "Say, Jim, come take a look at number eleven; one of the stamps is wobbling all over—first it drops about 2 inches and then about 10," he shouts in my ear. "A broken shoe, my boy," I yell at him as I reach for the cam stick. "D—those foundry people, any way; why can't they send us decent castings? That last lot of shoes are the hummest I ever saw." Going down stairs: "Hey, Henry! open up number eleven and drive off that broken shoe." Well, that job done, and operations resumed, let's sit down and have a quiet smoke

for a few minutes. Wonder what will happen next?

Long about 4 o'clock here comes the super. "Jim, you boys will have to keep your eyes peeled a little closer down here; the tailings are running high the last few days." "All right, Mr. Spry, we'll make a change or two. You know we have been getting some of that buncy rock from the 1650—an occasional carload." I thought there would be something doing—life would be too easy if there wasn't a kick coming from somewhere once in a while.

A half hour later: "A-ha, that feeder man again," at sight of dark streaks on number two's plates, indicating grease. "Look a-here, Joe, haven't I told you to be more careful when you are oiling those stems? I'll not tell you many more times."

Well, I guess as soon as I've weighed up the "silver" and made out the day's report, it will be about time to wash up and change my clothes.

"Hello, Bill—yes, it has been a little strenuous to-day. Not much time to sit down and think about it. Sleep well, to-day?" "Best I've done for a month." "Say, Bill, the super says tailings are going too high. I had Jack raise his vanners a bit. Well, good night, Bill." "Good night, Jim."

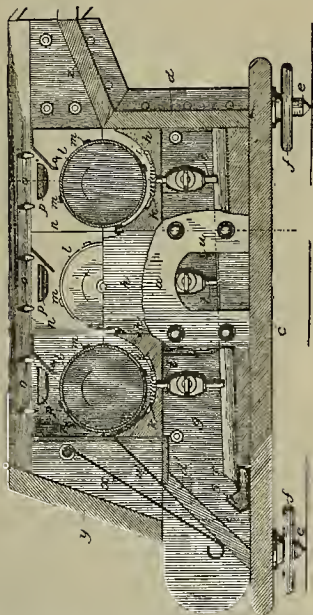
BOSS HEAD.

Mining and Metallurgical Patents.

Patents Issued December 30, 1902.

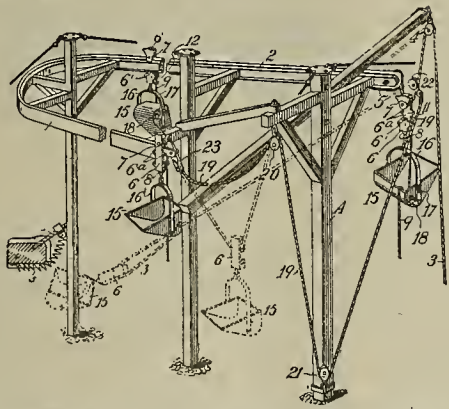
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

AMALGAMATING APPARATUS.—No. 717,195; J. J. Hill, Denver, Colo.



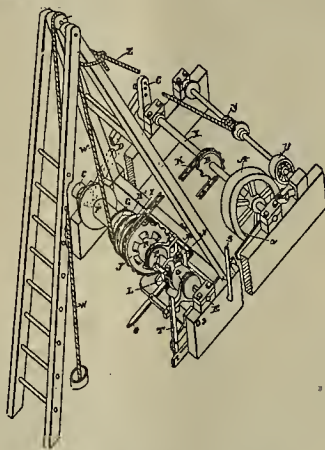
In amalgamating apparatus, combination with supporting frame, of basin for holding body of quicksilver, copper cylinder having ribs at intervals on surface and supported in frame to rotate in basin with its surface always above surface line of body of quicksilver below it, and pulp passage formed between basin and cylinder and constricted toward its overflow side.

CONVEYER.—No. 717,063; C. J. Allen, San Francisco, Cal.



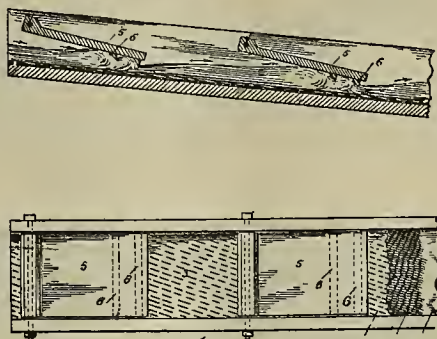
Conveying apparatus consisting in combination of single, rigid inclined track, having return bend and lower terminal adjacent to higher end of track, burden carrier, hoisting rope secured to higher end of track, fall rope secured to lower end of track, guide sheaves in line with track and above respective ends thereof through which ropes pass, connections between ropes whereby they are raised and lowered in unison, and stop means at lower end of track operated by movement of ropes by which carrier is prevented from leaving track while hoist is being operated.

DRILLING DEVICE.—No. 717,095; L. A. Hardison, Santa Paula, Cal.



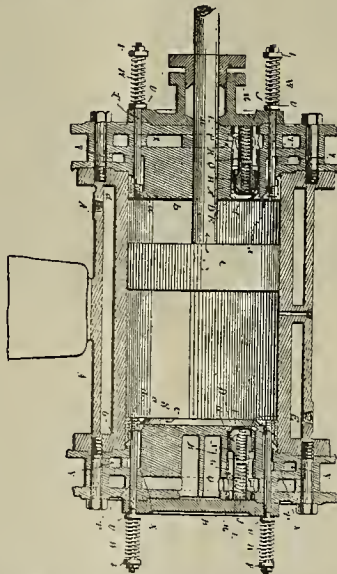
In well drilling machine, combination with tool operating shaft, same having usual operating means; duplex rope engaging drum revolvably mounted upon shaft, and provided at one end with internal and external bevel gears, and band engaging channel on outer circumference; sleeve longitudinally movable on shaft and provided at one end with external beveled gear, adapted to engage, at extreme of longitudinal movement, with internal gear on drum, and having at other end worm gear; bull wheel revolvably mounted on sleeve, sleeve having longitudinal movement therein, bull wheel having internal beveled gear, adapted, at one end of stroke, to engage external beveled gear on drum, and means to throw gear in and out.

SLUICE OR RUNWAY.—No. 717,301; G. Telford, Oroville, Cal., assignor to Risdon Iron & Locomotive Works, San Francisco, Cal.



Sluice or runway provided with deflecting plates 5 pivotally secured at upper ends to sides of sluice or runway and being suspended longitudinally thereof, free end of each deflecting plate being provided on under surface with series of transverse strips 6 rigidly secured thereto, strips being inclined or beveled in the direction of flow through sluice or runway.

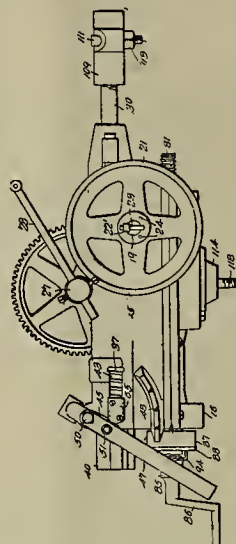
VALVE FOR AIR COMPRESSORS.—No. 717,029; E. Reynolds, Milwaukee, Wis.



In combination with cylinder-head having opening extending therethrough; valve seat mounted in and resting against shoulder formed in forward end of opening; valve guide also mounted in opening having central stem G formed with pockets I, J; head H formed upon end of stem; enlarged portion O connected to stem by ribs Q, and ports P; cup shaped valve mounted upon head H; shell N intermediate

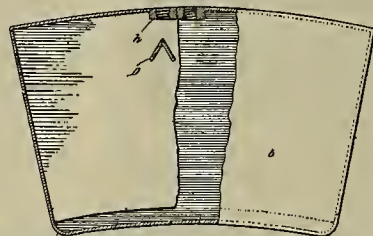
valve seat and enlarged portion O; and springs K and L mounted in pockets I and J respectively.

ROCK DRILL.—No. 717,027; J. H. Redfield, Spokane, Wash.



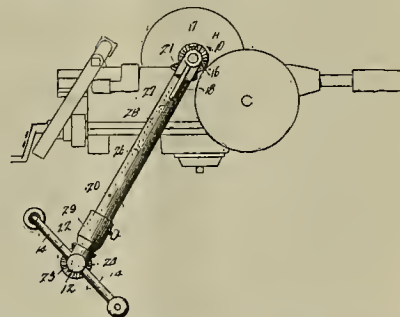
The combination with drill shaft having fixed collar, of cam shaft recessed intermediate of its length to permit passage of collar, and cam mounted on shaft having operating face extending approximately from axis of rotation of shaft; pair of actuating cams mounted on shaft at each side of recess, cams each having curved operating face and straight radial face, curved face extending approximately from center of rotation of shaft, and radial face being in alignment with recess of cam shaft.

BOSH PLATE FOR BLAST FURNACES.—No. 717,248; J. C. McCausland, Pittsburg, Pa.



Bosh plate provided with continuous horizontal chamber which extends from front to rear and from side to side thereof, horizontal division plate extending through chamber from rear nearly to front and dividing chamber into upper and lower compartments which communicate only at inner end of bosh plate, and water connections located at outer edge of bosh plate and on opposite sides of line of union between division plate and outer end wall of bosh plate.

ATTACHMENT FOR ROCK DRILLS.—No. 717,028; J. H. Redfield, Spokane, Wash.



An attachment for rock drills, comprising auxiliary crank shaft, bracket carrying same, tube to which bracket is secured, socket member carried by tube and adapted for application to and pivotal movement on main crank shaft of drill, and gearing connecting the shafts.

Specimens Received.

C. B. Ferguson of Copper Mountain, Alaska, sends to the office of the MINING AND SCIENTIFIC PRESS handsome specimens of crystallized epidote, associated with fine quartz crystals and iron ore; also, several specimens of beautifully crystallized grossularite—a variety of lime alumina garnet. These minerals are of common occurrence in the gangue of copper ores, but not often found in such handsome specimens.

The rock specimen received from Michigan Bluff, Placer county, Cal., is green chert, or jasper (quartz), and has no commercial value. The color is probably due to iron. It is probably a greatly altered sandstone.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALABAMA.

CALHOUN COUNTY.

It is reported at Anniston that for two years a 20-stamp mill has been in operation near there on ore averaging \$36 a ton. The mine is 20 miles from Anniston and 70 miles from Birmingham. The ledge runs 1½ mile northeast and southwest. The paystreak varies in width from 2 feet to 4 feet.

ALASKA.

A. Wacberg, who has quartz and placer claims on Kodiak island, says he has been prospecting on the island for ten years and speaks well of the quartz mining outlook, but denies the report that there are good placers. He has several placer claims, but says they are of little value. Wacberg, with the Uyak G. M. Co., has built a 10-stamp mill, which will be in operation March 1, and expects to have other mills in operation.

A miners' meeting was held at Valdez January 2nd to consider the adoption of miners' rules for the Valdez recording district. The principal topic discussed was that of restricting the location of claims by power of attorney.

A report from Douglas says the Seven Hundred mill at Treadwell is to be moved across the channel to Silver Bow basin back of Juneau. The company expects to have the mill in operation there by June. A 10-stamp mill has been ordered for the Nevada creek properties and will be in operation by March 1. The company will employ 200 men next season. M. Hudson of Douglas is superintendent of the work at Nevada creek.

ARIZONA.

COCONINO COUNTY.

J. J. Penhale, manager the Hance Asbestos M. Co., whose properties are in the Grand canyon north of Williams, says he has twenty men at work and is packing the product of the mines to the rim of the canyon, using thirty burros. He shipped their first car of asbestos to the Eastern market this week.

COCHISE COUNTY.

The Copper Glance M. Co., near Bisbee, employs thirty-two men and will establish eight hours for all kinds of work, says the Review.

The Dos Cabezas G. M. Co. has now developed water and their machinery is being put in place.

At the Lowell mine, near Bisbee, they are driving a tunnel from the railroad to the shaft, where they will put in a landing station. At the Calumet and Arizona property the tramway is in operation.

GILA COUNTY.

J. P. Faull and P. Oates have given an option on their coal claims, the Reed group, in the San Carlos district, northeast of Globe, to the Saddle Mountain M. Co., who want coke with which to smelt their ores. Manager Chittenden of the Saddle Mountain Co. says he will begin operations next week.

MARICOPA COUNTY.

Work is resumed in the White mine near Wickenburg.

Griffin and Breed have bonded the Vermonter group to the Arizona Leader Mineral Syndicate of Cleveland, Ohio. This group consists of four claims in the Hassayampa district, south of Prescott, near the Senator mine.

The Monte Verde M. Co. will be organized to develop these claims. W. G. Reese, of Prescott, is manager.

MOHAVE COUNTY.

Work on the German-American mines, near Kingman, is going ahead. On the Treadwell the shaft is down 200 feet and in ore. At the Pioneer the shaft is down 100 feet and the company is putting up a hoisting plant. Electric drills will be used. At the 35th Parallel a tunnel is being driven on the ledge.

A gasoline hoist is being set up at the Queen Bee mine, near Chloride. The collar of the main shaft has been retimbered. H. Lefler is foreman and J. Deter, superintendent. The Elkhart mill is in operation. J. Barry is putting up a hoist on the Town mine. Superintendent L. Hoffman is shipping ore from the Samoa mine by pack train.

PINAL COUNTY.

W. A. Langhorn and partners several months ago bonded a number of claims on Picocho peak to California men. They have run a tunnel 186 feet and 100 feet of

drifts and crosscuts and have cut the main lead.

The Bonanza G. M. & S. Co., near Casa Grande, will put in steam hoisting works, air compressor and drills. J. C. Loss is manager.

YAVAPAI COUNTY.

At the Morning Star mine, near McCabe, Superintendent M. J. Enright is making a paying mine out of a promising prospect.

It is reported a good body of ore has been opened in the Gold Dust mine of the Hudson group, near Prescott. The ore is grey copper and runs \$50 per ton in gold.

The Poorman mine at Walker is being developed under bond by J. W. Francis of Flagstaff. The shaft has been enlarged and is being sunk. A vein 4 feet wide carries values in gold and silver. The owner of this property, A. H. Mitchell, is superintendent.

The Treadwell smelter at Mayer is in operation with oil burners, the change from coal burners being completed.

A hoist and other machinery are being installed at the Lelan mine at Chaparral. The main shaft is down 200 feet, with 600 feet of drift and tunnel. E. Wells is superintendent.

J. Caspar has bonded his group of claims, near McCabe, to Douglas, Lacey & Co., who have put on three shifts sinking. Caspar remains in charge of development. A hoist is being put in at the Cypress mine. The Parker mine, southwest of McCabe, is putting up a hoist.

It is reported that the mine fire in the United Verde copper mine at Jerome, that has burned for the past four months, has been extinguished by employing carbon dioxide in large quantity and excluding oxygen.

CALIFORNIA.

AMADOR COUNTY.

The Bay State mine, north of Plymouth, has begun sinking the shaft 300 feet deeper, which is down 800 feet. Rock is being milled from two ledges. Twenty-four men are employed by the company. W. W. Worthing is superintendent.

The Southerland Bros., sinking a shaft on their claim on the ochre lead west of Plymouth, are down 45 feet.

A body of ore was cut last week in the south drift on the 1000-foot level of the Fremont Con. near Drytown. C. E. Purington, superintendent.

CALAVERAS COUNTY.

The company owning the Occident-Keystone mine at Mokelumne Hill have begun the construction of a cable suspension bridge. They will put in cars, tracks and machinery for an 80-ton per day plant.

Work is reported suspended at the Last Chance mine, near Angels.

A shaft is being put down on the Independence gravel mine on the Birney ranch, 1 mile from Angels. It is intended to go to bedrock. Several attempts have been made to reach bedrock in this ancient channel, but thus far have failed, owing to large volume of water found.

The Chronicle says at the Keystone-Occident mine, near Mokelumne Hill, a winze is being sunk in the tunnel, and at a depth of 10 feet 4½ feet of ribbon quartz has been cut, carrying free gold and galena, assaying \$15 per ton. On the Belvoir mine, an extension of the Keystone-Occident, the ore has developed a pay shoot. These properties belong to the Black Cat Oil & M. Co.

The Beatrice mine at Murphys has its machinery in and mining is resumed.

DEL NORTE COUNTY.

The North Del Norte mining district, south of Waldo, Or., is attracting attention. Since the copper discoveries made last spring miners have gone into the district and many claims taken up are being developed. H. W. Jackson and C. W. Baker of Del Norte have 1100 feet of tunneling done on ore that carries silver and gold.

P. Clark of Spokane has a bond on the Albright mine, in the district. He has men at work.

EL DORADO COUNTY.

The Glebenhain Bros.' stamp mill last week finished a run on ore from their mine at Poverty Point, near Placerville. —C. Edner is said to have made a strike in his gravel mine at Omo.

During the year 1902, 333 location notices and 249 certificates of labor were filed for record with the county clerk upon claims in El Dorado county.

In the Volcanoville district, at the Two Channel mine men are sluicing and preparing for the winter's run. Water is running in the Daggett ditch and men are at work on Buckeye hill. The Josephine tunnel No. 5 is being driven.

At the Montezuma mine at Nashville the north shaft is down 400 feet and the 10-stamp mill is in operation.

KERN COUNTY.

The December cleanup of the Butte mine, near Randsburg, from eighty-nine tons at the Red Dog mill resulted in three bars worth \$6000.

LOS ANGELES COUNTY.

Crude oil is advancing in price. It is now worth 74 cents a barrel in the local market. Fourteen gravity oil which sold for 40 to 50 cents a barrel the last twelve months now commands 74 cents.

The Home Oil Co. has its third string of tools at work at Whitlier, drilling well No. 18, south of No. 15.

G. Robinson has the contract for drilling a well for the Central Oil Co. at Whitlier.

NEVADA COUNTY.

The Telegraph says an estimate on the amount of ore produced during the last twelve months is placed at \$1,200,000. The amount of ore crushed was 83,000 tons. In developing properties 27,500 feet of work has been done at a cost of \$225,000. The amount of money paid for wages was approximately \$520,000.

The Ironclad M. & M. Co. property, at Rough and Ready, is sold to the Gear-Ironclad G. M. & M. Co. H. M. Black, E. F. Irwin, S. J. McConnell, A. Wright, G. C. Hay is superintendent.

PLACER COUNTY.

At the California M. Co. at Shady Run fifteen men are working and gravel is being taken out. R. A. Watson, superintendent of the Shady Run M. Co., says the lower tunnel will be extended 3000 feet to tap three pay shoots. The upper tunnel is in 400 feet. It is expected that the first shoot will be reached in 500 feet. The ledge is 22 feet in width. The property has a 5-stamp mill.

At the Rawhide Con. M. Co. twenty men are at work. The main tunnel is in 720 feet. Ore from the mine is conveyed from the ledge to the mill at the river, a distance of 2100 feet, by an aerial ropeway with buckets.

G. Nissen, owner of the Annie Laurie mine, near Colfax, is building a ditch to carry water to his claim.

The Alameda G. M. Co. at their mill in Black canyon, near Westville, have ten stamps dropping and they have battery space for ten more when required.

Superintendent C. D. Akers of the Hidden Treasure mine, above Forest Hill, says the company is taking out an average of 2500 cars of gravel per week.

The new mill at the Bonnie Bee mine, near Emigrant Gap, is in operation. The main tunnel is in 500 feet. Twenty-eight hundred tons of quartz have been taken out. The Zebright mine, 200 yards east of the Bonnie Bee mill, and an extension, is to have a 20-stamp mill in the spring, says the Sentinel.

At the Great Channel mine, southwest of the Hidden Treasure, near Sunny South, the tunnel is in 1920 feet and an upraise started to strike the gravel.

ORANGE COUNTY.

Well 34 on the Santa Fe lease, in the Fullerton field, is down 2600 feet. The company is said to be looking for light oil in this well.

PLUMAS COUNTY.

A. W. Whitney has reopened the New York mine in Indian valley, near Greenville, and has started up the mill, ten men being at work underground. —At the Johnny Bull mine, recently bonded to C. Droege and M. Connell, Eastern parties, a cyanide plant is being installed.

SANTA CLARA COUNTY.

After twenty years' idleness the original shaft of the Guadalupe quicksilver mine is again open and work is in progress. Since August 12, 1902, pumps have been working to unwater the mine. The 200-foot level is opened and it is reported that the ore is rich.

SHASTA COUNTY.

The Mountain Copper Co. is unloading twenty-five carloads of coke at the smelters at Keswick. This is what remains unsold of recent large importations.

C. F. Nourse has sold to the Iron Mountain Inv. Co. the Alice Fraction quartz mine in Flat Creek district.

The heavy rains of the past few days have swollen the little streams in small gulches, and placer miners are doing well. Near the old town of Shasta, L. Seiler, a school boy, found a nugget that he sold for \$49.21. At Newtown, in Buckeye district, I. Quinn found a \$35 nugget.

The Mountain Copper Co. is refusing entrance to mail and passenger stages to its property at Iron Mountain. The company also refused to accept rent money from occupants of its cottages near the mine, and has ordered all of its houses occupied by employees' families to be vacated. It is reported that should the strikers declare the strike off and desire

to return to work unconditionally the company would not allow them to do so. The company are credited with the assertion that they will not take back into its employ a single miner or smelter man who walked out when the strike was declared.

All the lands belonging to the Keswick Crude Oil Co. were jumped New Year's morning. Sixteen hundred acres were relocated by a party of twenty men. The land is in Sand Flat region, 3 miles east of Keswick. The claims jumped include the hole drilled by the Keswick Co. to a depth of 1000 feet. No work was done in 1902, as the company was involved in litigation and had no money in the treasury.

The strikers of the Iron Mountain Co. no longer ask for the reinstatement of the five men who were discharged for cause. All that is asked now is the recognition of the union. Work has resumed in a small way at the mine, where non-union men are caring for leaching vats and working at timbering and mining in the mine itself. No union men are allowed on the mine reserve, where a dozen patrolmen do guard duty.

SIERRA COUNTY.

Oklahoma capitalists will develop gold mines near Poker Flat. They are known as the Rose and Harold properties. A company has been incorporated for this purpose at Guthrie, Ok.

SISKIYOU COUNTY.

Whitney & Co. have pumped out their claim on the Klamath river, near Oak Bar, and are taking out pay gravel.

TUOLUMNE COUNTY.

The Altadena M. & I. Syndicate has sold to W. L. Holmes of Detroit ninety acres near Columbia, also the Kearsarge No. 2 and Altadena quartz mines.

Superintendent Bryant of the Prudhomme mine, near Carters, says he made on Jan. 1 a \$900 cleanup for nine days, the mill running one shift daily.

The compressor at the Big Casino mine, near Groveland, is in operation. —At the Two Brothers sinking is resumed and will go down 130 feet farther, at which point drifts will be run. —It is reported that a 6-foot vein of ore has been cut in the tunnel at the Shoenberg mine. —At the Mount Jefferson mine the mill is running on ore from the drifts east and west on the 400 level. A gasoline engine and pump are being set up to raise water from the creek for battery use.

The Banner reports during the year 1902 there were 448 locations of quartz claims recorded in Tuolumne county. There were seventy-one placer and gravel locations, fifty-six water rights taken up, seventeen millsites located and seven reservoir sites claimed and recorded.

COLORADO.

The Denver Post says the following figures represent the official reports from authoritative sources of the gold, silver, lead and zinc output of Colorado for the calendar year 1902. The only account omitted is that of the Colorado & Ohio smelter, located near Salida, which opened for business about December 1 and details of its production for the limited period are lacking:

Gold.....	\$27,416,941.94
Silver.....	8,146,092.21
Lead.....	5,221,109.20
Copper.....	1,088,763.34
Zinc.....	1,901,448.00
Total.....	\$43,774,354.69

According to the official report of H. A. Lee, State commissioner of mines, the output of 1901 was:

Gold.....	\$27,679,445.04
Silver.....	10,901,365.89
Lead.....	6,419,131.61
Copper.....	1,303,297.17
Zinc.....	1,095,224.00
Total.....	\$47,398,463.71

This shows an apparent loss of gold, silver, lead and copper, due largely to the demoralized condition of the metal market during the year, but a gain in zinc output. Another cause is the lower average grade of ores treated. While the tonnage output has been larger, particularly in Cripple Creek district, owing to improved processes, much lower grades have been handled. During 1902 the zinc ore sold and exported amounted to 60,000 tons, which averaged 32% metallic zinc. At an average price of 4½ cents, the total value was \$1,728,000. The Canyon City Zinc Works produced 3,854,400 pounds, all of which went into the manufacture of paint. At an average value of 4½ cents, the value was \$173,448. During 1903, by reason of the erection of two other reduction plants at Pueblo and Canyon City for the treatment of zinc ores, the yield will be increased.

BOULDER COUNTY.

Manager R. S. Earhart, the Colorado Northern G. M. Co., near Wallstreet, says they have completed the installation of their electric plant and have two box electric drills in operation. Regular shipments have begun from the body of ore opened in the winze sunk in the 1330-foot drift.

Sinking has been discontinued in the shaft on the Gold Lode, near Wallstreet, and drifting east and west from the shaft is under way.

Another strike is reported in the Long-fellow mine at Jamestown. The ore shoot on the second level, from which this company has been shipping for several months, has been opened at the third level 425 feet west of No. 2 working shaft. The new body is 3 feet wide, 12 inches of which runs \$250 a ton. Selected ore runs eight ounces gold and 1400 ounces silver per ton.

Last week two more strikes were made in the Boulder oil belt. The 2:10 - Mars joint well has 1000 feet of oil in the hole and will begin pumping this week. The Boulder-Valmont has struck the sand and oil is filling the hole. The sand has not yet been drilled through. Oil was reached at 1935 feet. The output for the belt was 13,304 barrels during the year.

M. S. Rafeld, treasurer of the Valley Forge G. M. Co. of Boulder, says operations will be resumed. The Valley Forge tunnel will be driven to the Fortune dyke which crosses the property.

The Tripp R. Co. has bought the Blast mine and mill at Ward. They will overhaul the mill and install a plant for the use of the Tripp process, of which roasting is a feature.

CHAFFEE COUNTY.

The W. B. Martin Leasing Co. has been incorporated at Colorado Springs to operate on the Raven claim of the Prudential M. Co. at Granite. The lease runs for three years and work was started this week. There are two shafts on the property of the Prudential, but the leasing company will sink another. In a 40-foot shaft on the property there is a streak of ore running \$35 per ton. This shaft is narrower than required by law, however, and it will be necessary to either enlarge and refit it or else sink a new one on the same vein.

CLEAR CREEK COUNTY.

The Clear Creek M. & R. Co., F. R. Carpenter general manager, whose smelter is at Golden, gives the following record for 1902:

	Value.
Gold—22,128.55 ounces.....	\$457,397
Silver—124,133 ounces.....	62,000
Copper—232,764 pounds.....	27,931

Total\$547,328

This was extracted from ores having an average value of \$10 per ton and largely from a single furnace. A second furnace has been added which will probably double this output in 1903. All of its product was sold in the form of copper matte and is included in the returns.

The Terrible mine at Georgetown is installing a 150 H. P. engine and boiler to be used as an auxiliary to meet emergencies.

Texas men have control of the Little Flat mines on Ute creek, near Idaho Springs, and are putting in a hoist and boiler and will sink the shaft to 1000 feet. W. A. Gable is manager.

The Waldorf properties near Georgetown, including the Paymaster, Commonwealth and Independence, are shipping out ore by pack train.

The Yankee Con. Co. will build a 100-ton amalgamating and concentrating mill at Yankee. A water power plant and dynamo will be installed to drive the mill and furnish power to the mines. A wire tramway 1½ miles long will be built between the Lombard and Faust mines to the mill.

The Manhattan tunnel will be continued and bids are being called for, for 200 feet. The sinking of the Faust shaft will begin and twenty-five men will be employed in this.

A contract has been awarded Craze & Freeman to drive the Central tunnel near Idaho Springs. The face is in 1542 feet.

Manager Teagarden, the St. Paul G. M. Co., has begun operations on the extension of the Aliunde vein. The company has five claims on the Aliunde vein. The tunnel will cut the lode 2000 feet in and give 1000 feet in depth.

CUSTER COUNTY.

It requires five four-horse teams to remove the concentrates from the Bassick mine near Silver Cliff to the depot for shipment, though the mill is working but one shift a day.

Work has been resumed at the Bull-Domingo, near Querida, one shift in the 550 and the other in the 1000 level. Fif-

teen tons a day are being hoisted. It will be treated at the Le Rand mill.

The Hillside R. Co. will put up a plant at Custer to treat the ores of the Rita Alta C. Co., of which H. L. Comstock is superintendent.

EL PASO COUNTY.

The United States Reduction Co. at their plants at Colorado City and Florence report for 1902 as follows:

	Tons.	Ounces Contained.
Standard plant.....	150,442	188,053
Colorado City plant.....	100,000	130,000
Union plant.....	125,000	156,250

The United States R. & R. Co., operating zinc works at Canon City, reports for 1902: Four thousand tons of zinc-lead pigment containing 60% zinc oxide and 40% sublimed lead white, having a valuation at the works of \$225,000; 400,000 pounds copper, 1200 ounces gold, 100,000 ounces silver.

The United States R. & R. Co. at Colorado City have bought the patent of D. Hawkins and H. W. Fox for manufacture of chlorine gas by application of electricity. The company will erect a plant for the manufacture of chlorine gas which will cost \$100,000.

FREMONT COUNTY.

The Stadacona Oil Co., a Canadian corporation, has leased oil land south of Florence, and has let the contract to A. Gullinger.

The Hector mine, near the Bassick, near Florence, is sold to the Melrose G. M. Co. and the name changed to Contact No. 2. Manager C. W. Haskell says the company proposes to erect a mill. Heavier machinery will be put in to further develop the property.

The Royal George Coal Co. has leased the Price coal mine near Canyon City and is installing machinery to reopen the property. E. G. Bettis is manager.

The Copper King concentrator and mill-site at Dawson camp, near Canyon City, have been sold by the sheriff to satisfy claims of men who built it, amounting to \$2500. The cost of the concentrator was \$17,000. J. S. Harris of Canyon City was the buyer.

The inflow of water in the Valley View M. Co. property near Florence is ninety gallons a minute. This is handled by the pumping plant recently installed. Three shifts are at work on the shaft.

Electric drills will be used in exploration work by the Peerless Copper Co., near Florence.

GILPIN COUNTY.

A company of New York men has been formed to operate the Freedom mine on Bates hill, near Central City. Two 80 H. P. boilers and an engine will be put in at the mine. The company is also negotiating for the Ridgewood mine. The pumping will be done from the Ridgewood, as there has been connection made between them.

The Gowers Mine Syndicate of London has taken a lease and option on the Pierce mine, above Central. Machinery is being placed. E. M. Messiter will have charge of the properties.

The shipments of ore from the Gilpin county mines to the smelters for December were 340 cars, or 6800 tons. For the entire year the shipments amounted to 4469 cars, or 89,380 tons. To this must be added 15,000 tons of concentrating ore shipped to the mills at Idaho Springs, which brings the total to 104,000 tons. The shipments to the local mills were a little higher than in the previous years, owing to the fact that a good deal of mill ore was formerly sent to the Golden smelter. Comparing these figures with those of 1901, the production of the county is over \$4,000,000. The shipments from Black Hawk for 1901 amounted to 70,946 tons, showing that for 1902 there has been an increase of almost 25%.

GUNNISON COUNTY.

It is reported that the Raymond, near Ohio City, will resume.

HINSDALE COUNTY.

L. Sherbino has let a contract for 300 feet of work on the Pennsylvania group in the Burrows Park district, near Lake City. Five men are at work on the property. The Dupre Co. has let a contract for 100 feet of work on the Cashier lode, Park district. Work began last week.

LAKE COUNTY.

The Fryer Hill Mines Co. at Leadville have completed dead work in the El Paso and are now breaking ore. Some of the ore in the old stopes carries fifty ounces in silver and a little gold. From the Jamie Lee, Cora Belle and Bangkok, shipments are going out regularly at the rate of 500 tons per day.

The Long Tom, on Sugar Loaf mountain near Leadville, is being prospected by a party of miners. They have cut the

lead at 125 feet in the shaft and are drifting on the vein. Taylor and Greene are in ore in their lease off the 600-foot level of the Little Ellen incline, Leadville. Fifteen tons daily are shipped of gold-lead ores.

The Bohn, at Leadville, is being operated under lease by E. L. Daniels. They are shipping iron ore and prospecting.

At the Rex combination, near Leadville, operated by the Keystone M. Co., the shaft is unwatered and sinking resumed. The shaft will be sunk another 100 feet and at that point it is expected to cut the mineral found by the diamond drill.

The Lillian mine on Printer Boy hill is producing 100 tons a month of gold ore through the different set of lessees. In addition to this, bodies of low-grade milling ore have been opened up which will be cyanided.

Superintendent Linderman says in the spring a mill will be put up at the Little Louise property, near Birdseye, Leadville district.

The Herald-Democrat's figures on production of the Leadville district show a total valuation for the past twenty-five years of \$298,000,000. The product for 1902 is \$9,468,544, divided as follows: Gold, \$1,302,680; silver, \$3,051,195; lead, \$1,694,410; copper, \$308,409; spelter, \$3,103,448; manganese, \$8400. The total tonnage for the year is given at 748,746.

P. K. Connolly has resumed operations at the Dolly B. in Evans gulch, Leadville.

The Valentine M. Co. near Leadville have completed the unwatering of their properties.

The Peerless and Peerless Maud, operated by H. Dyatt in the Horseshoe district, are shipping ore. Two pockets of lead carbonates have been opened and the ore will average \$25 per ton. Dyatt is building a concentration mill in connection with the Last Chance mine and will concentrate most of the product of these two mines.

MINERAL COUNTY.

Output from Creede Camp for 1902:

	Cars.	Tons.
January.....	291	4,803
February.....	256	4,563
March.....	281	4,710
April.....	275	4,778
May.....	267	4,593
June.....	384	6,475
July.....	361	6,596
August.....	377	7,003
September.....	347	7,079
October.....	366	7,719
November.....	337	7,362
December.....	176	4,210

Total	3,728	69,891
Silver, ounces.....	1,400,000	
Gold, ounces.....	17,560	
Lead, tons.....	31,000	
Zinc, tons.....	3,100	

This shows a decrease from 1901 of 851 cars, or 9600 tons; but the concentrates shipped in 1902 amounted to 3 to 1 in proportion to 1901. The price of silver operated against an increase in its production. The shipment for December is short, owing to a two weeks' suspension of shipments by the railroad changing from narrow to broad gauge. The shipments tabulated were made from the Bachelor, Commodore, New York-Chance, Del Monte and United Mines, on Bachelor mountain; the Ethel, Solomon, Ridge, Champion and Punxsutawney, on Campbell mountain; the Molly S, on Mammoth, the Corsair and Alpha, on McKenzie Mt., at Sunnyside. The principal development work of the district was the extension of the Humphrey tunnel 1000 feet and 3000 feet of drifting on the United Mines property.

The Manhattan M. & D. Co. has incorporated to operate at Creede. They own four claims joining the Alpha on the south. The vein has been prospected by shafts, varying from 20 to 30 feet, to ascertain its strike and dip, but the principal one is an incline 60 feet in depth, from the bottom of which a crosscut was run 70 feet, cutting the vein.

J. M. Jennings and R. H. Jackson have a contract to drive 100 feet in the Iowa tunnel, near Amethyst.

OTERO COUNTY.

The La Junta Oil & Gas Co. has struck oil in its well 2 miles south of La Junta at a depth of 1600 feet.

A second well is being put down at Manzanola, but the oil sand has not as yet been reached.

OURAY COUNTY.

Ouray production in 1902:

Gold.....	\$2,850,000
Silver.....	1,750,000
Lead.....	430,000
Copper.....	40,000
Total.....	\$5,070,000

Du Prau and others, leasing on the Grizzly Bear, near Ouray, have closed

down for the winter on account of snow.

B. H. Du Prau and Arps Bros. have a lease on the Eggleston group of five claims in Mount Sneffels district, between Ouray and Camp Bird.

The capacity of the concentrator at the Camp Bird, Ltd., near Ouray, has been increased by the addition of two Huntington mills.

PARK COUNTY.

Park county during 1902 produced: Gold (lode), \$150,000; gold (placer), \$100,000; silver, \$40,000; lead, \$35,000. Total, \$325,000.

The lessees on the Maverick, in the Badger mountain district, 8 miles from Lake George, have resumed sinking in the shaft, which is down 80 feet.

PITKIN COUNTY.

Pitkin county output for 1902:

Production of silver ore.....	\$1,800,000
Payroll per month.....	60,000

Number of men employed 700. The most important event of the year was the discovery of gold ore.

SAGUACHE COUNTY.

The Miner says the mill on the Crestone townsite will be remodeled by New York men for the treatment of Sunbeam ore. Concentrating tables will be put in. Miners are at work on the Sunbeam property.

SAN JUAN COUNTY.

The San Juan output in 1902 is reported:

Gold	\$2,100,000
Silver.....	1,000,000
Lead.....	300,000
Copper.....	100,000

Total.....\$3,500,000

A steam plant is being installed at the Silver Ledge mill at Chattanooga. The engine used at the old mill is being overhauled at the Gold King shops to be placed in the new mill. At the mine seventy men are taking out ore and opening new ground.

SAN MIGUEL COUNTY.

This county reports production for 1902 as follows:

Gold	\$1,800,000
Silver.....	1,100,000
Lead.....	100,000
Copper.....	50,000

Total.....\$3,050,000

The crosscut tunnel driven on the Butterfly-Terrill, near Telluride, several hundred feet below the old workings, has cut the lode and drifts are being driven both ways by two shifts.

SUMMIT COUNTY.

The mineral output for Summit county in 1902 was as follows:

Placer gold.....	\$150,000
Gold from ores.....	250,000
Silver.....	160,000
Lead.....	159,000

Total.....\$719,000

A gouge has been cut in the Marcelle Co.'s crosscut tunnel at Montezuma. This is considered evidence that the vein has been cut. The company is still driving the tunnel with the same force and better progress is being made. The company is figuring on machinery to be installed early in the spring, also a tram to convey the ore from the tunnel to the road where it can be shipped.

TELLER COUNTY.

At the Oil Creek tunnel, on North Oil creek near Gillett, Superintendent R. Lynch is crosscutting in the tunnel, which is in 300 feet.

The Bolivia Co., near Gillett, have resumed after an idleness of nearly two years. A few weeks ago their shaft house was burned, destroying the machinery, but a new and larger plant has been installed. The company expects to sink the shaft another 100 feet.

The total tonnage of Cripple Creek district treated by mills and smelters for December amounts to 55,700 tons, at an average of \$36 per ton, making a total of \$2,005,200. During the year the total number of tons of ore mined in this district and treated by mills and smelters amounted to 635,357 tons, having gross value of \$21,177,800. Dividends were declared during the year to the amount of \$2,170,522. Aside from this it is estimated that leasing companies and lessees, who keep their business private, made a profit of \$350,000.

At the mines of the Portland G. M. Co., Cripple Creek, besides the new battery of boilers and the air compressor, the company will install belt conveyors. Skips are to be used in the shaft, doing away with the cages. The work of sinking No. 3 shaft has passed the 1000-foot mark. Work has begun on the proposed drain-

age tunnel for Cripple Creek. The funds for the tunnel have practically been raised, chiefly among the mines along the west border. The tunnel will start from the southwest edge of the district and will run northeast, connecting with the El Paso shaft at a depth of 600 feet. From that point it will be run an additional 1000 feet, tapping the first main water course. It is expected that the draining of the district will be begun by the beginning of next October and will result in the further development of the Elkton, Moon-Anchor and Anchoria-Leland mines, and also greater activity in the El Paso, Mary McKinney, Gold King, Midget and other producers on the west side.

The Rocky Mountain Leasing Co., operating on the south end of the Delmonico, Cripple Creek district, are making steady shipments of ore of \$60 average value. This ore is being broken at the 200 level, where the vein of pay rock is 3 feet wide. A drift has been run 80 feet on it. A contract has also been let for 100 feet of additional sinking. A leasing company operating on the Dexter, on Bull hill, is taking out ore at the 300 level. Waldron and associates, leasing on the Chiclehawk, on Guyot hill, have cut the south extension of what they believe to be the Mary McKinney vein at the 600-foot level. The pay portion of the dyke is 4 feet in width and of smelting grade. An output of ten tons a day is being made. The lessees operating on the War Eagle are outputting forty tons daily. All the ore is being broken at the 60-foot level, where the ore body is 12 feet in width.

McDade and associates, leasing on the Pharmacist, Cripple Creek district, are breaking ore at the first and second levels in the old workings. A shipment of twenty-five tons was made last week. The Olympia Co. has resumed on block No. 7 of the Cameron townsite.

General Manager W. F. Rock, the Gold Sovereign M. & T. Co., Cripple Creek district, in his annual report says the main shaft was sunk 100 feet during the year, making it 550 feet deep. That portion of the property is under lease to the Cripple Creek & G. T. M. Co. The operators' lease runs to August 1, 1903. There are five sets of lessees and seven sets of sublessees operating on the company's property, employing in all forty men. Ore is being produced by three of the lessees and all of the sublessees. No work was done north of the shaft during 1902.

Superintendent Burch says work is resumed on the property of the Little Giant Co. in Pony gulch, Cripple Creek district. The company let a contract for 50 feet of sinking, which will make the shaft 150 feet deep.

President Neville of the Free Coinage Co., Cripple Creek, says ten leases have been granted on the Free Coinage estate. Among the principal lessees are Goldsworth and Wilhelm, who have a lease of one year on the Wilson claim, being an extension of one year; Shell & Co. a lease on the Pinto grounds; Lagstaff will work on the Pueblo claim of this company. All the leases extend for one year, and royalties are graded from 20% to 35%.

Three hundred men are at work on leases granted the first of the year. Mine owners believe that more work is done under the leasing system with better results for the company than under company direction.

At the Blue Flagon, Raven hill, Cripple Creek district, machinery, including a cage, has been bought. An old shaft is being enlarged and retimbered, while miners in another shaft are breaking and hoisting ore. When worked formerly the shaft was lost and for a long time the claim was idle. The vein now being worked is supposed to be the extension of the Joe Dandy.

During December the Golden Cycle mine, Cripple Creek district, made a total production of 3500 tons, the greater part being taken from the main workings, as the lessees were hindered by legal complications. The main shaft, which is down 925 feet, will be sunk to the 1100-foot point.

The output of the Independence Con. (Hull City placer), Cripple Creek district, is averaging 70 tons daily of \$40 ore. For December the output was 2000 tons from the company's workings and from leases on the ground away from the main workings. A contract is let for 200 feet of sinking. The present shaft is down 1150 feet. Two oil wells were opened up in the Florence field last week. Other wells are to be drilled.

Sinking is resumed on the Delmonico claim of the Union Co., Cripple Creek district, and the three-compartment shaft will be lowered to 500 feet. Until all the ore is stoped out above the 200-foot level to surface it is the intention of the leasing company to hoist the ore through the old shaft, down the hill, and which is connected with the three-compartment shaft.

The El Paso Con. M. Co. has the contract to drive the Cripple Creek drainage tunnel. Ore heading starts south from

the El Paso south drift and another will run easterly from the El Paso's northeast crosscut. As both of these headings will start in the El Paso mine, that company can use its air and steam lines and hoist the rock through its three-compartment shaft. Machinery will be installed in Arequa gulch, where a shaft is to be sunk to enable two headings to be started from there and also at the portal on Cripple Creek.

Horn & Archibald, leasing below the 200-foot level of the E. Porter Gold King, Cripple Creek district, have received returns on two carloads of ore that was settled for at \$30 per ton.

In prospecting the ground at a depth of 450 feet, J. Wright, operating the Thompson of the Elkton Con. Co., Cripple Creek district, is reported to have opened up the extension of the "hull pen" stope, worked in the fourth level south of the Elkton shaft.

Sinking is resumed on the Zoe, on Beacon hill, Cripple Creek, and will go down an additional 75 feet. The shaft is down 600 feet. The property is being worked by Best & Hanson, who have a bond and lease.

IDAHO.

ADA COUNTY.

The Five Bars M. Co., with headquarters at Boise, has been incorporated. The directors are E. Brannon, S. W. Roberts of Boise; A. E. Hostler, W. Eyre of Chicago; C. E. Whipple, Little Fiddler, Idaho; G. J. Porter, St. Louis. The properties are on Boise river.

BLAINE COUNTY.

At the Shamrock mine in the Smoky district, near Hailey, the tunnel is in 115 feet, and ore is being taken out which assays \$12 in gold.

CASSIA COUNTY.

S. McIntyre reports that at the Belcher mine, near Albion, in the tunnel being run to the main ledge at a depth of 1500 feet, at 1600 feet from the opening a cross ledge was cut showing values in silver, lead, copper and gold. Work continues as the main ledge is still ahead.

IDAHO COUNTY.

Superintendent B. Haug says the Dewey mill at Thunder Mountain is hung up till spring. Twelve men will work in the mine. The upper tunnel is in 200 feet and a winze sunk 30 feet from the tunnel. A flow of water prevented sinking to a greater depth. The lower tunnel will be driven 730 feet to the ore body and will be 100 feet under the upper tunnel. It is now in 360 feet. The Sunnyside Co. has sunk a shaft 180 feet. This company is running a tunnel to be 600 feet long, which will tap the ore at depth, and is in 300 feet.

OWYHEE COUNTY.

W. C. Orem and associates of Salt Lake City, Utah, have closed a deal for the Palmer group at Silver City. The group is on Florida mountain, adjoining the Trade Dollar.

Salt Lake people have taken the Palmer group of gold claims near Silver City. The prospects consist of seven claims on the extension of the Trade Dollar mine, and the consideration is \$50,000. It is the intention to form a company and develop the mine. W. Orem is manager.

SHOSHONE COUNTY.

The Park copper property, in the vicinity of Stevens peak, near Wallace, has its tunnel in 165 feet, and for the past 60 feet has been producing chalcopryite. The ledge is 25 feet wide, 6 feet of which is shipping ore. The tunnel is being run on the side of the ore chute and a crosscut driven every 20 feet.

The Little Giant, 2 miles south of Mullan, has resumed. There is galena showing in the upper tunnels, and another tunnel started on the east side of the mountain will tap the ledge at a depth of 500 feet. This tunnel will be 1000 feet long.

The Mullan M. Co., on its property in Deadman's gulch, 1 mile above Mullan, recently encountered a 5-foot ledge containing galena and copper ore.

The Little Chief, near the Hunter mine, at Mullan, is reported to have good ore and will put on an extra shift of miners.

The American-Commander, near Wallace, resumed this week; the company has let a contract for an extension of its tunnel 200 feet.

The Ajax M. Co. is rushing work in the tunnel adjoining the Hercules, near Wallace.—The Tamarack, north of the Custer mine, has cut the lead at a depth of 400 feet near the end of a 1000-foot tunnel. They found 4 feet of galena and carbonate ore. Another contract will be let.—The Snowstorm is making 100 feet per month on its lower tunnel.—Ore bodies have been encountered in the Tarbox and two shifts are drifting each way on the ledge. Work on the lower tunnel, known as

No. 6, at the Morning mine, near Mullan, has passed the 4000-foot mark. When completed, it will be 10,000 feet long, and it is estimated it will have cost \$150,000. The tunnel is 6x8 feet in the clear, and will cut the lead at 2400 feet below the cropplings.

It is reported the main shaft of the crusher at the Bunker Hill & Sullivan mill at Wardner broke last week, and it will probably be two or three weeks before repairs can be completed. The haulage of ore through the long tunnel had to be suspended. So as not to stop the operation of the mine entirely, the old tramway is being used. There is a small crusher at the end of the tramway, above Wardner.

The Oom Paul, a silver-lead property, above Burke, will resume, says H. J. Read, one of the owners.

Improvements to the extent of \$10,000 are to be made to the Northwest Sampling Works, near Wallace. The capacity of the plant will be increased to 1000 tons per twenty-four hours. Electric power from Spokane will be used.

Because the mining companies of the Cœur d'Alenes refuse to pay the taxes levied on the valuation of their mines, the county is unable to meet the payment of bonds to the amount of \$25,000. Some of the mine owners say they do not intend paying taxes and will fight the matter in the courts. The owners of the Hercules mine are the only ones willing to pay their taxes. The property of that company was assessed at \$50,000. The company, it is reported, was offered \$2,000,000 for the property. The other companies have already paid their taxes on the improvements on their property, which they have always paid. On most of the producing properties of the district the assessor assessed at \$500,000 each. Among these were the Bunker Hill & Sullivan, Empire State, Mammoth, Standard, Hecla and Morning. The Hunter was valued at \$200,000 and the Crown Point at \$100,000.

INDIANA.

During 1902 there were 3944 wells completed, of which 631 were listed in the gas well and dry hole column. The average production of completed wells is above that of any previous year in the record of the field. The daily production of crude oil of the Indiana field averaged between 24,000 and 27,000 barrels. Since operations for oil and gas were begun in the State there have been 22,252 wells completed, at an average cost of \$2000 each.

MONTANA.

BEAVERHEAD COUNTY.

A 15-stamp mill is at work on free-milling ore at Indian creek, near Wisdom.

It is reported that the mines of the Hecla Con. M. Co. at Glendale have closed until the price of silver advances to a point at which the property can be operated at a profit.

BROADWATER COUNTY.

Four men are at work in the Champion group at the head of White Horse gulch. At 500 feet from the mouth of a tunnel, in a 140-foot crosscut from the tunnel, a blind lead has been found 6 feet in width in which there is an 18-inch pay streak. The point where the lead was encountered is 175 feet below the surface.

S. Wisemiller says he has struck 6 inches of \$37 milling gold ore in the Lorna Doone claim in the Park district.

CARBON COUNTY.

It is reported F. W. Parker, G. Dygert and C. K. Gilfillen have bought the coal property at Joliet known as the Shanks mine. The railroad company will build a spur to the mine and development work will begin this month. T. Wilcher is superintendent.

DEER LODGE COUNTY.

The Ophir M. Co., which is working the Ophir mine in the southern part of Anaconda, contemplates sinking the shaft on the property 500 feet deeper, giving a total depth of 800 feet.

FLATHEAD COUNTY.

The Mustang Con. G. M. Co. has bought the Alabama group in the West Fisher district, near Libby.

Larson & Greenough, of Spokane, Wash., have taken a bond on the Banner & Bangle property, near Troy, in the Grouse Mountain district, which is close to the line between Montana and Idaho. The bond is to run a year and calls for the payment of \$50,000.

The Libby Placer M. Co. recently made a payment on the purchase price of the Howard brothers' placer ground on Libby creek. The property contains 1000 acres and two ditches, one of which conveys water from Libby creek to the diggings and the other from Ramsey creek.

Baeger & Scarlett have sold the Cedar group of claims on Libby creek, near

Libby, to Cleveland, Ohio, men for \$30,000. There are five claims in the group.

JEFFERSON COUNTY.

The Basin Reduction Co. has incorporated to operate at Basin. D. A. Howell, J. Maas, H. Smith, directors.

G. Benjamin and partners are developing a group of claims between Elkhorn creek and Boulder which contain manganese.

B. F. Forbes and A. M. Holters of Helena are shipping iron ore to Flinn station from their mine on Dry gulch, east of Elkhorn.

LEWIS AND CLARKE COUNTY.

Work on the Evening Star mine, in the Scratch Gravel district, 3 miles north of Helena, has reached the depth of 30 feet and a 30-foot tunnel run therefrom. A shipment of ore netted \$18 per ton in gold. The property is owned by E. R. Furnell and associates.

B. F. Forbes of Helena says he has arranged to open the Union mine, which is an extension of and joins the Holter lead.

The Columbian M. Co., operating in the York district, north of Helena, is installing electric motors to replace the ones destroyed by fire last fall. The motors will be operated by water power and will run the power drills in the Golden Messenger mine.

MADISON COUNTY.

The Chili M. Co.'s mill on Sand creek, 8 miles from Pony, is being torn down to be removed to Butte. The company is composed of Milwaukee men.

MISSOULA COUNTY.

Superintendent Short of the Tarbox mine, 2 miles from Saltese, reports a strike in the west drift about 150 feet from the double-compartment shaft, which has been sunk 225 feet. The last 40 feet of this drift showed from 5 to 7 feet of concentrating ore. He says the east drift is in 150 feet from the shaft and the lead is being crosscut. The Tarbox Co. will sink the shaft to open the vein to a depth of 325 feet.

The Copper Bell mines, near Clinton, says Superintendent Ketcham, will buy a diamond drill to prospect the property.

SILVER BOW COUNTY.

The hoisting plant of the Lexington mine, between Butte and Walkersville, was destroyed by fire on January 1; loss, \$50,000; no insurance; cause of fire unknown. The Lexington is a silver mine and has not been extensively worked for some years. A few months ago the property was sold to L. Giard.

A number of Butte miners who have previously won prizes in drilling contests are training for the contest to be held during the Mid-winter Carnival at El Paso, Texas, this month.

J. J. Barry, Deputy State Inspector of Mines, in his annual report on the mines of Silver Bow county, shows that the Amalgamated Co. has the greatest number of men employed and next in the list is the United Copper Co. Following is a table showing the number of men employed at the Amalgamated properties:

	Top Miners.	Engi- Men. neers.
Anaconda.....	2,356	468
Boston & Montana..	982	153
Butte & Boston.....	464	83
Parrot.....	320	66
Colorado.....	350	26
Washoe.....	125	30
Total.....	4,597	826

The grand total of the Amalgamated Co., exclusive of the lumber yards, Butte & Boston and Colorado smelters, is 5497.

The appended table shows the number of men employed at each of the mines of the Heinze properties, exclusive of the employees of the smelter:

	Top Miners.	Engi- Men. neers.
Rarus mine.....	420	55
East & West Cora....	200	25
Nora.....	59	20
Total.....	679	100

W. A. Clark employs 615 men at his mines, and 250 men at smelter, making a total of 865 men.

The totals:
Employed at Amalgamated mines.. 5,497
Employed at Heinze..... 788
Employed at Clark's mines..... 615
Other mines..... 275

Total.....	7,175
Number of employees in the lumber yards and the two smelters of the Amalgamated.....	525
Number of employees at the Heinze smelter.....	150
Number of employees at Clark's smelter.....	150
Total.....	925

Total of all men employed at both mines

and smelters and lumber yards, 8100.

During the period covered by the inspector's report there were thirty-three men killed in the mines of Butte and forty-two accidents to employes that were not fatal.

The Sailor's Dream mine and mill, 14 miles northwest of Butte, owned and operated by A. Barton and P. Kendrick, is closed till spring. Owing to a scarcity of water in the gulch in which the mill is located, no runs have been made this winter.

J. S. Harris, receiver of the Snohomish and Tramway mines at Butte, has filed his thirty-third monthly report in the United States Court. Unlike former reports, this one shows that in November there were no receipts, while expenditures amounted to several thousand dollars, due to the recent decision of the Circuit Court at San Francisco, Cal., which had the effect of closing down the two mines pending a further hearing of the suit between the Boston & Montana M. Co. and F. A. Heinze.

NEVADA.

ELKO COUNTY.

Manager A. Carlson of the Deer Creek mine, near Charleston, says he will put up a stamp mill having a capacity of fifty tons per day. The property is 45 miles northeast of Tuscarora and 8 miles east of Gold Creek, and carries gold-silver ore running \$25 per ton.

LINCOLN COUNTY.

At the Rambler mine, at Searchlight, Superintendent C. E. Maud says the 22 H. P. gasoline hoist is in operation, and sinking is resumed in the shaft.

The double-compartment shaft on the Green Monster mine at Sandy is down 175 feet and in ore. This mine is owned by the Hearst estate. F. O. Wilkinson is superintendent.

LYON COUNTY.

At the Mazuma mine in Pumpkin Hollow, near Yerington, Glines, Cavanagh & Clark are drifting north and south on the 150 level. The ledge is 2 to 3 feet in width and the ore will average \$20 per ton. Shipments will begin in the spring.

The Silver City M. & Drainage Co. has men at work enlarging the Daney tunnel, the ultimate object of which is the drainage of the Silver City and Devil's Gate districts mines.

NYE COUNTY.

The McNamara Co. have let a contract to sink their main shaft 1000 feet, and to drive 600 feet of crosscuts at the 500 and 1000 levels when reached.

The Indiana-Tonopah, near Butler, whose properties adjoin the California-Tonopah on the north and east, has begun a double-compartment shaft. The contract for buildings was let last week. F. Dunn is superintendent. At the Golden Anchor, northwest of the Mizpah, the shaft is down 100 feet in gray porphyry containing seams of quartz. J. Y. Kane is superintendent.

The 50 H. P. boiler and engine of the West End Co., near Butler, are being set up, and next week sinking from the 200 station to 500 feet will begin. Work on the Rescue Co.'s property began last week with M. Sheridan as superintendent—enlarging the shaft to a double-compartment. The main shaft of the Halifax, 1 mile east of Mount Oddie, is down 300 feet and crosscutting begun. At this depth water has been encountered. The main shaft of the Tonopah Chief is down 45 feet in mineralized porphyry. At present a whim is being used for sinking, but a steam hoist will be put in.

STOREY COUNTY.

At the Con. California & Virginia, Virginia City, the total extraction of ore for the week ending Jan. 3 was eight cars, assaying \$48.76, and 147 cars, assaying \$21.12. At the Hale & Norcross the tunnel was advanced 12 feet during the week; total length, 3362 feet. The face is in diorite.

WASHOE COUNTY.

A group of claims at Olinghouse is reported bonded to J. J. Mahoney of Wadsworth. A double-compartment shaft will be sunk to develop the group.

WHITE PINE COUNTY.

J. A. Traylor, manager the New York & Nevada C. Co. mine, near Ely, shot and killed J. Staggs, J. Smith and S. Johnson and severely wounded three others when attacked in his office at Keystone on the 7th inst. by several men said to be members of the Miners' Union. The shooting was the outcome of the strike declared against the company several weeks ago owing to wages being cut from \$3.50 to \$3 a day. The men claimed that Traylor was responsible for the reduction, and it is said that threats were made against his life. Traylor received information that he would have to leave

town. He announced that if assaulted he would defend himself. Traylor was in the company's office at Keystone when the men entered with the avowed intention of running him out of camp. One of them grabbed him by the throat while several others caught him from behind. Traylor broke away from his captors, drew his revolver, and fired six shots. The uninjured men ran out of the office after the shooting, leaving three dead and three wounded on the floor. Traylor's home is in Denver, Colo. He was employed by the copper company at Durango, Mexico, previous to taking charge of the mine near Ely.

NEW MEXICO.

GRANT COUNTY.

Shipments have been resumed from the Granite Cap, near Silver City. An effort has been made by the owners to have freight rates and treatment charges reduced.

The Beck mine has been bought by the National G. & S. M. Co. for \$5000.

OREGON.

BAKER COUNTY.

Superintendent L. Walker of the Cracker-Oregon mine, near Baker City, reports that calaverite has been struck in the Cracker-Oregon. He is sinking on the ore shoot. The shaft will be double-compartment, the foundation for the hoist being already laid and the gallowes frames up.

D. Grant and J. Bumgardner of Bourne have sold to J. W. Hughes, F. S. Shaw and A. Saylor of Seattle for \$11,500 the Porcupine, Greenback, Victor and Victor Fraction claims, 1½ miles from Bourne.

BAKER COUNTY.

The Black Jack group, near Sumpter, is reported sold to Nebraska men. This group is south of the Red Boy mine and is the southern extension of the Oregon Monarch group.

The Oregon S. & R. Co. have 100 men at work on the buildings of their smelter being erected at Sumpter. The sampling mill of 700 tons daily capacity is partially completed and the foundations for the ore bins are laid. The dust chambers are finished and the steel smoke stack, which will be 130 feet high, is going up.

Manager O. Townsend of the Baby McKee and Last Chance mines in Cable Cove district says a two-compartment shaft 4½ x 9 feet is being sunk at the junction of the Eagle and Last Chance veins and is down 55 feet. A crosscut is being run to the hanging wall. After this work is finished the shaft will be sunk to 100 feet and a drift run under the old tunnel. The Bonanza mill at Geiser is dropping twenty stamps. A crosscut from the 850 level of the main shaft has cut the ore body.

GRANT COUNTY.

Near Susanville, Hughes & Sanderson have opened up a 6-inch vein of free-milling ore at a depth of 50 feet. The entire ledge is 24 inches. The claim lies north of the Badger mine and near the mill built by the Badger Co. The Badger Co. put a pump in the Bull of the Woods last week where they have a 20-foot ledge of ore. W. Cooper sold to N. C. Haskell of Baker City his one-half interest in the Monarch and Oreolo quartz claims. Graham & Heaton Bros. have begun work on the Daisy. Smith Bros., at the Princess mine, have cut a 4-foot ledge at 60 feet in the shaft.

The Old Arastra M. Co., whose property is on Granite creek, 4 miles north of Granite, have decided to drive the tunnel 50 feet farther and upraise to the crosscut tunnel 96 feet above. It is also the intention to run a crosscut tunnel west.

JACKSON COUNTY.

J. W. Coffman has sold 240 acres of placer ground on Forest creek, near Ashland, to E. A. Spaulding et al. of Tacoma for \$10,000.

The Hicks quartz mine on Blackwell hill, near Medford, is reported sold to C. A. Greigson of Gold Hill.

JOSEPHINE COUNTY.

J. Shaska and P. Robinson have bonded their property in Owl Hollow, east of Grants Pass, for \$40,000 to Colorado men represented by T. J. Pearce of Gold Hill.

East of Baker City, near Medical Springs, development work has been in progress at the Sanger mine under management of J. K. Romig. Some time ago the property was sold to Eastern people. A company has been formed to be known as the Sanger Gold Mines Co. President, F. W. Paine, Walla Walla; superintendent, J. K. Romig. The company has bought water rights on upper Eagle creek and early in the spring will install an electric plant operated by water power.

PENNSYLVANIA.

PAYETTE COUNTY.

On the 2d inst. the abandoned workings of the Eddy creek colliery beneath the town of Oliphant caved in and engulfed four buildings. The loss is \$40,000. No one was killed.

LUZERNE COUNTY.

A further increase in the number of men in the mines is reported by coal companies throughout the region. There are now 85% working. The operators are urging the men and more coal is being mined per man than at any other period in the history of coal mining.

SOUTH DAKOTA.

CUSTER COUNTY.

A strike of gold ore is reported on the Roosevelt group of the Grantz G. M. Co., 8 miles from Custer, in a drift started from the bottom of an old shaft, half a mile from the main shaft, near the southwest corner of the Roosevelt group. The ore is said to contain free gold and sylvanite.

LAWRENCE COUNTY.

According to the most reliable report, the mines of the Black Hills produced \$3,373,392 during 1902. The output for December is estimated on the basis of production of November. The gold product for 1901 was \$7,500,000. Following is the table of tonnage and production of mines for 1902:

Mine.	Tons Milled.	Gold Values.
Homestake.....	1,339,200	\$4,663,930
Golden Reward....	177,800	1,393,000
Horseshoe.....	62,100	760,510
Imperial.....	50,600	220,000
Spearfish.....	47,206	211,030
Holy Terror.....	17,800	206,000
Dakota.....	44,032	174,000
Lundberg & Dorr..	18,720	116,000
Clover Leaf.....	24,480	98,300
Wasp No. 2.....	31,000	93,200
Portland.....	12,000	84,000
Alder Creek.....	13,822	59,428
Hidden Fortune.....	45	45,000
Deadwood-Stand'rd	10,289	40,444
Columbus (3 mos) ..	3,850	38,500
Golden Slipper....	3,000	20,000
Placer (est.).....	.....	100,000
Intermittent producers.....	5,000	50,000
Total.....	1,860,944	\$8,373,342

The average value per ton was \$4.44. The output will be increased from 30% to 40% by six new cyanide plants now in course of building. These plants will be running before March 1. Following are the new mills and their respective monthly capacities:

	Tons.
Horseshoe.....	30,000
Hidden Fortune.....	7,500
Penobscot.....	6,000
Jupiter.....	4,500
Hall & McConnell.....	1,800
Golden Crest.....	1,500
Total.....	51,300

The Penobscot 40-stamp mill, near Deadwood, is in operation. The cyanide process is used. F. R. Byrnes is superintendent. The Golden Crest cyanide mill and cyanide plant, near Deadwood, is in operation. These two plants will add 200 tons to the daily amount of ore treated in the county.

At Garden City, the Penobscot M. Co. cyanide plant and mill are in operation.

UTAH.

The mineral output of Utah for 1902 is estimated as follows:

146,978,597 pounds lead, at 4 cents per pound.....	\$ 5,879,143 88
26,373,780 pounds copper, at 11.59 cents per pound....	3,048,608 10
15,692,733 ounces silver, at 52.15 cents per ounce.....	8,160,325 84
194,863 ounces gold, at \$20 per ounce.....	3,897,260 00
Total.....	\$20,985,337 82
Production for 1901.....	17,580,457 88
Increase for 1902.....	\$ 3,404,879 94

BEAVER COUNTY.

Foreman C. Price of the Old Hickory mine at Milford reports a strike of copper ore at 200 feet in the tunnel.

The ledge in the Erie mine, near the O. K., has been cut at the bottom of the shaft, down 132 feet. The shaft will be continued to 150 feet, when drifting will begin.

Manager B. T. Lloyd of the Copper Ranch and Copper Mountain Co.'s mines, near Milford, says operations will be resumed. A gasoline hoisting plant will replace the whim on the Jewel Mound shaft, and later another hoist will be in-

stalled on the east end of the property. At the Copper Mountain it is intended to sink the vertical shaft deeper, which is now down 230 feet.

moth mine, Tintic district, in a section of the mine hitherto unexplored, being to the west of the old workings.

A strike is reported in the north drift from the 1000 level of the Ajax at Mammoth.

PIUTE COUNTY.

Manager B. Luce of the Mt. Baldy mine at Marysville has let a contract for 100 feet of tunnel work.

BOX ELDER COUNTY.

The Brooklyn of Pine canyon, Park Valley district, has been bonded to Wisconsin men.

JUAB COUNTY.

Manager McIntyre of the Mammoth at Tintic says the repairs to the hoist are completed and operations at the mine resumed.

Ore is reported opened up between the 1100 and 1200 levels of the Lower Mam-

SALT LAKE COUNTY.

Near Bingham, at 330 feet in depth, on the Zelnora's incline, a drift is being run easterly in carbonate ore carrying copper, lead, silver and gold. It is expected that the Frisco tunnel will cut the Zelnora vein at 1200 feet. The tunnel is in 900 feet.

The Big Mitt G. M. Co. is incorporated to operate the Pacific mining claim in Little Cottonwood district, near Alta. G. C. Kittle, A. W. Clayton, E. H. O'Brien, W. J. and D. Wolstenholm directors.

The Chloride Point mine, near Salt Lake City, has resumed, says H. Brown, who controls the property, and two shipments have been made.

W. H. Tibbals says he has bought the Papea and Trida, two patented claims at Bingham. These two claims are near the Dewey mill.

Manager J. A. Jacobson of the Centennial of Bingham says a body of galena ore was struck last week in a drift which is being run 400 feet from the mouth of the tunnel.

SUMMIT COUNTY.

Foreman McDonald of the Little Bell, near Park City, says the shaft is down 450 feet. He is raising and drifting from the 300 level. The drift is in ore.

Superintendent Rood, the Ontario mine, Park City, says the force has been reduced by one-half, but there is no intention of ceasing operations. "In 1901 we thought that the price of silver had reached as low a point as would permit a reasonable profit from mining our ores and selling them to the smelter under our contract. The annual report showed a net profit of 12 cents per ounce of silver on ore mined. Yet the present quotation is 10 cents lower than our average sale price for 1901. It has been considered advisable, therefore, to discontinue the extraction of ores until existing conditions are bettered. There is yet a large tonnage to be taken out above the 1500 level, and no ore has been extracted below it, except in the drifts and raises. Development of the mine between the 1500 and 2000 levels will be continued."

The hoisting plant at the Creole at Park City is in operation.

UTAH COUNTY.

It is reported S. A. King has bought the Deseret mine in the Gold Mountain district, near Provo, for \$20,000. The property consists of seven unpatented claims.

WASHINGTON.

FERRY COUNTY.

Superintendent J. C. Cale says the tunnel on the Nova group, southeast of the Mountain Lion mine, near Republic, is in 250 feet, passing through quartz and stringers of spar in porphyry.

OKANOGAN COUNTY.

At Nespelem Wheeler & Chapman of Vermont will install a custom mill on the Hattie E. early next spring. E. K. Jacobs has been working on the Kickapoo, employing four men on a contract, and has been making 2½ feet per day. They are in ore that runs \$30 in gold and silver. The property has been bonded by Jacobs & Brown to A. D. Walker of Seattle. Dr. Hudnutt is working six men on the Multnomah claim and will drive a tunnel to tap the veins at depth. He is taking out ore.

The Ventura group of eight claims has been bonded by Hollis & Hunter of Spokane. The Ventura group is on Robinson creek, in the Methow district, on the line of the proposed Methow railroad.

The Ben Harrison group, near Chasaw, has been bought by the Opal M. Co. of Ohio for \$25,000. It is a copper proposition carrying gold values.

SNOHOMISH COUNTY.

The tunnel on the Toledo, owned by J.

Walter, on Granite peak, near Index, is in 70 feet and shows copper, gold and silver ore. The formation is quartzite.

At the Golden Rule claim of the Golden Eagle M. & D. Co. above Mineral City, the work on the new tunnel and black-smith shop 300 feet below the present tunnel has been started. On the Mountain Beauty an open cut has been made, showing the ledge. On the King William two tunnels each 45 feet on the ledge have been driven.

WYOMING.

H. C. Beeler, State Geologist of Wyoming, says in his annual report for 1902 in the past five years over 500 miles of wagon roads connecting various camps in southern Carbon county alone have been made, of which 300 miles were built in the last two seasons. There are nineteen recognized oil fields, of which twelve are being developed. The largest field is located in the Salt Creek district of Natrona county, where the Pennsylvania Co. has thirteen producing wells and owns the only refinery in the State.

CARBON COUNTY.

The Elkhorn mine in Whisky park, near Dillon, is reported bonded and sinking is resumed.

The Northwestern Co. is sinking an incline shaft on the Eclipse on Cow creek, near Dillon. The shaft is down 90 feet and is following a vein of copper ore. A. Woodruff is superintendent.

A vein of coal 3 feet in width has been encountered in a tunnel of 130 feet by the Carbondale Coal Co. at Carbondale. The new coal bin is 20x40 feet in size with a capacity of 200 tons. The tippie will be 68 feet high.

CONVERSE COUNTY.

Work has been resumed on the Aetna, near Beaver, with R. Daniels in charge.

LARAMIE COUNTY.

A syndicate of London and Denver men is said to have bought the onyx quarries at Hartville, in the northern part of this county. Two carloads of this onyx were recently shipped to Denver.

FOREIGN.
BRITISH COLUMBIA.

(Special Correspondence) — Notwithstanding the drawbacks of the past year, for which neither mine owners nor mine workers were responsible, the year 1902 has shown a decided advance in the Boundary district, both as regards the amount of development work and the results as shown by ore shipments from the mines.

The records show that in the year 1900 — the year that the C. P. railroad completed its branch line into the Boundary — a little short of 100,000 tons of ore were sent out from several shipping mines. In 1901 the shipments increased nearly four fold, the total being a few tons short of 390,000 tons for the full twelve months. In 1902, the figures for the last few days being estimated, as the figures are not yet made public, the total is over 500,000 tons.

Had it not been for the events following the explosion in the Fernie coal mines in East Kootenay in May, whence the only coke supply can be obtained at a price that will admit a profit on these ores when smelted, there is reason to believe that this record would have been much larger.

Throughout the year a few mines have been regular shippers from Boundary district. Six of these have shipped steadily and have been locally known as the "Big Six." They are the Granby and Snowshoe in Phoenix camp, the Mother Lode and Sunset in Deadwood camp, and the Emma and B. C. in Summit camp. The only one of these that has shipped every week of the year is the Granby, although the Mother Lode can show a nearly similar record.

In relative importance, as shown by the tonnage, these mines may be placed in the following order: Granby, Mother Lode, Snowshoe, B. C., Sunset and Emma. Three of these have shipped only to their own smelters, namely, the Granby, Mother Lode and Sunset.

Granby, Phoenix camp, 319,713 tons; Snowshoe, Phoenix camp, 21,153; Mother Lode, Deadwood camp, 144,671; Sunset, Deadwood camp, 11,615; B. C., Summit camp, 15,024; Emma, Summit camp, 11,478; Winnipeg, Wellington camp, 785; Golden Crown, Wellington camp, 625; No. 7, Central camp, 482; Jewel, Long Lake camp, 2175' sundry small shipments, 2300. Total for 1902, 520,026.

The month of December shows the largest tonnage of any single month, notwithstanding that three of the seven blast furnaces in local smelters were cold a part of the month. About 60,000 tons were shipped during December, the next largest month being October, when 55,000 tons were sent out.

During the year 1902, two of Boundary's

three smelters—the Granby and Mother Lode—were running continuously for the twelve months, with the exception of the time when coke supplies were cut off in summer. The Sunset smelter began operations about the time that coke supplies failed, but this has also run steadily since coke was steadily forthcoming.

The Granby smelter is located at Grand Forks, having four blast furnaces, two copper converters which handle the matte from the other two Boundary smelters also. Two additional furnaces have been ordered recently in Chicago, which will give a capacity for these works of 2200 tons of ore daily. This smelter takes little custom ore, with the exception of some from Republic, in Washington, largely used as converter linings.

The Mother Lode smelter is at Greenwood and has two blast furnaces. Two more furnaces will be added the coming year. Mother Lode and some custom ores are reduced at this smelter, including those of the Snowshoe and B. C. mines.

The Sunset smelter at Boundary falls, 4 miles below Greenwood, was originally built by the Standard Pyritic S. Co., but was not blown in till bought and remodelled by the Montreal & Boston C. Co. last spring. The same company owns and operates the Sunset mine in Deadwood camp, taking also ores from the B. C. and Snowshoe mines. The Sunset smelter has one furnace and is installing a second, to be ready in January, and has placed the order for a third.

Boundary mines have not yet gotten to the stage where dividends have been paid. As is usual with low-grade properties, it requires years of preparation and the investment of large capital to reach this point, but several promise to enter the dividend class this coming year. Nothing official has been given out as to the values of the ores. The ore of this section is nearly all of the copper-gold variety and low grade—but there are mountains of it, so that the expense of extraction is reduced to the minimum. The values have been estimated at \$4 to \$6 per ton; \$5 is probably a fair average. On this basis the mines of the Boundary have produced during the year ore that is valued at \$2,500,000.

A few mines have been developed during the year showing high values, notably the Providence, near Greenwood, from which a few cars have been shipped, running from \$100 to \$150 per ton. But the general run of the ore is low, and it is only by using the best modern equipment in mines and smelters that the properties can be made to reach a paying basis, as it is now believed they have. One feature of the mining development the past year is the system of open quarrying of ore. By this plan all hoisting is done away with, the ore being broken down and run through chutes or by trams to the railway by gravity.

Phoenix, B. C., Jan. 2.

The combined output for the three principal districts of British Columbia for 1902:

	Tons.
Rossland.....	319,714
Boundary.....	520,026
Slocan.....	28,429
Total.....	868,169

The ore shipments from Rossland camp for 1902, being the dry tonnage returns from smelter reports, were:

Mine.	Net Tonnage.	Est. Gross Value.
Le Roi.....	202,530	\$2,600,000
Le Roi No. 2.....	52,500	800,000
Center Star.....	35,820	437,004
War Eagle.....	21,819	334,048
Rossland G. W.....	2,400	36,000
Giant.....	2,850	42,000
Cascade.....	300	4,000
Kootenay.....	30	300
Bonanza.....	90	1,500
Velvet.....	1,350	25,000
Spitzee.....	20	400
White Bear.....	5	100
Totals.....	319,714	\$4,280,352
Total for 1901.....	279,133	

The following is the payroll for 1902, which the Miner says is accurate with respect to the big mines and estimated in the case of the smaller properties, from which actual figures were not obtainable:

Le Roi.....	\$ 463,150
Le Roi No. 2.....	214,500
Center Star.....	168,397
War Eagle.....	123,913
Rossland Great Western.....	50,000
White Bear.....	18,000
Kootenay.....	15,000
Giant.....	5,000
Velvet.....	50,000
Spitzee.....	3,000
Cascade and Bonanza.....	5,000
Other mines.....	5,000
Total.....	\$1,120,960

The Slocan ore shipments for 1902, with average value of ore per ton, were:

	Tons.	Av. Val.
Payne.....	1,976	\$100
Ivanhoe.....	637	75
Sunset.....	827	125
Reco.....	490	250
American Boy.....	1,134	50
Arlington.....	3,560	150
Hewett.....	805	40
Bosun.....	2,040	65
Last Chance.....	168	75
Wonderful.....	181	90
Enterprise.....	2,220	50
Queen Bess.....	180	75
Silver Glance.....	257	250
Whitewater.....	2,962	40
Slocan Boy.....	158	80
Neepawa.....	123	40
Monitor.....	1,306	80
Slocan Star.....	714	90
Wakefield.....	220	50
Rambler.....	4,187	75
Molly Gibson.....	2,100	60
Washington.....	187	80
London Hill.....	115	100
Ruth.....	846	100
Antoine.....	207	100
R. E. Lee.....	144	80
26 small mines (total).....	685	...

Total.....28,429

The Osoyoos & Similkameen Coal & Exploration Co. of Spokane, Wash., has secured 6400 acres of coal land in the Similkameen country, and will start development work in the spring. The company has also secured the Princeton townsite.

The Fern mine at Hall Siding, near Ymir, has been bonded to E. Rammelmeier.

New agitating tanks are being installed at the Bullion Extraction Works at Silica.

The Gold Coin P. & D. Co., at San Javier, have their fifty-ton smelter running. The fuel used is the natural coke from La Barranca, obtained 4 miles distant, which is delivered at \$7.50, Mexican, per ton. Some of their ores require concentrating, and a plant for that purpose will be put in.

An option has been given on a one-third interest in the Spotted Horse group near Ymir to E. Cole of Portland, Ore.

The Standard Development Syndicate, of Nelson men, has been formed to operate the Hunter V. mine, on the divide between Porcupine and Hidden creeks. The property consists of the Hunter V. and the Double Standard claims.

KLONDIKE.

There are fifty litigants over claim No. 4 in Lovett gulch at Dawson. The Gold Commissioner has the matter under advisement. The ground was staked in three ways. One class of stakers, the plaintiffs, planted their posts on the base line, claiming 250 feet up and down stream. Others staked on the right limit and claimed 1000 feet as hill property. The majority of the claimants staked in this manner. Some others staked the property as a fractional claim. Forty out of the fifty claimants gave testimony to establish their particular claims. The number testifying was the greatest ever participating in one case in Dawson's Gold Court. The Gold Commissioner will take several weeks to go through the mass of testimony before deciding which miner is entitled to the property. The claim pans well in gold all over the surface and was the central location in one of the fall stampedes.

MEXICO.

SINALOA.

A new mining district is being developed 40 miles southwest of Tierra Blanca. Two hundred American miners have within the past month gone into the section.

SONORA.

Near Bacoache a strike upon the extension of the Picacho gold property is reported. An American bought it from a Mexican for a small sum. At 103 feet the vein was cut. Assays give similar values to those from the Picacho.

President W. C. Greene, the Greene Con. C. Co., at Cananea, says the company is planning to double the capacity of the plant, which will give when completed a capacity of from 12,000,000 to 15,000,000 pounds of copper per month. A contract has been let for a 10-inch pipe line, 10 miles long.

The Cananea Herald reports the gold mines in the Pilares de Capteras, 60 miles south of Douglas, bonded by W. C. Greene for \$250,000, have been abandoned by him and have been sold by their owners to a Philadelphia corporation for \$300,000. It is stated that twenty men are at work there taking out ore.

SOUTH AFRICA.

A correspondent of the London Daily Mail reports that large and rich diamond fields have been found north of Pretoria.

PERSONAL.

FRANK LONGMAID of Montana is in Oakland, Cal.

DANA HARMON has returned to San Francisco, Cal.

W. DAVIES is assistant superintendent of the Lightner mine, Angels, Cal.

W. A. GABLE is manager the Little Flat mines near Idaho Springs, Colo.

J. N. HAMILTON of the Dewey mines, near Ibapah, Utah, is in Chicago, Ill.

C. PETERS of the McNamara mine, Tonopah, Nev., is in San Francisco, Cal.

W. BECK is superintendent at the Black Jack mine at Diamond, Juab county, Utah.

S. CURTIS, secretary of the King M. Co., Phoenix, B. C., is in New York City.

H. W. DURRELL is now chemist for the Avino Mines of Mexico at Durango, Mexico.

B. HAUG, superintendent Dewey mine, at Thunder Mountain, Idaho, is in Boise, Idaho.

SUPERINTENDENT CRANE of the Wedekind mine, near Reno, Nev., has resigned.

PRESIDENT J. DERN of the Con. Mercur M. Co., Mercur, Utah, is visiting in Nebraska.

SUPERINTENDENT F. CHAPPELLET, the Mohican mine, near Groveland, is in Oakland, Cal.

MANAGER G. B. UPTON of the Oro Grande mine, near Wickenburg, Ariz., is in the East.

A. WANBERG of Kodiak, Alaska, has returned to his mines there from San Francisco, Cal.

R. BELL, State Mine Inspector of Idaho, has returned to Boise from a visit to Salt Lake City, Utah.

T. WILCHER is superintendent the Shanks coal mines at Joliet, Carbon county, Montana.

J. A. MCINTYRE, of the South Keystone mine, near Sutter Creek, Cal., is in San Francisco, Cal.

J. K. ROMIG, superintendent Sanger gold mines, Medical Springs, Or., has gone to Milwaukee, Wis.

W. C. RALSTON, manager Melones M. Co., Melones, Calaveras Co., Cal., has returned from Boston, Mass.

MANAGER A. CARLSON, the Deer Creek mine, has returned to Charleston, Nev., from Salt Lake City, Utah.

B. HASTINGS, superintendent the Ramrod group of mines near Kingman, Ariz., has returned from the East.

J. W. SKELTON of Tonopah, Nev., is examining placers in the Hassayampa district, south of Prescott, Ariz.

SUPERINTENDENT MCMAHON, the Butte mine, near Randsburg, Cal., has returned from San Francisco, Cal.

E. M. MESSITER is superintendent Gowers Mine Syndicate operating the Pierce mine, near Central City, Colo.

F. E. WARE, superintendent of the Mount Shasta mine, near Redding, Cal., has returned from San Francisco, Cal.

W. L. WATTS has returned to Los Angeles, Cal., from Carters, Cal., where he has been making mine examinations.

J. R. CUNNINGHAM, secretary the Advance and Forest M. Cos., Sumpter, Or., goes East on business for both concerns.

C. F. BUNKER goes to Prescott, Arizona, near which place he will build a cyanide plant for the Golden Link M. Co.

H. S. ANDERSON, manager of the Shannon Copper Co., has returned to the mine, Clifton, Ariz., from Los Angeles, Cal.

R. W. ATWATER of London succeeds J. R. Robertson, deceased, as general manager the Ymir Mines, Ltd., at Ymir, B. C.

EDGAR KIDWELL, representing the Stirling Boiler Co., transfers his office this month from San Francisco to Denver, Colo.

L. D. RICKETTS, consulting engineer for the Greene Con. Copper M. Co., Cananea, Mexico, was in Los Angeles, Cal., last week.

W. CLIMO, superintendent of the Shannon mines, near Clifton, Ariz., has returned from a three months' trip through California.

L. HANCHETT has returned from Pittsburgh, Pa., where he had been in the in-

terest of the Old Town and Calumet, to Idaho Springs, Colo.

C. T. DURELL of Lewistown, Mont., is at his former home in Denver, Colo. Mr. Durell is manager Central Montana M. Co., operating in Fergus county, Mont.

A. G. LARSON, superintendent the Nickel Plate and Kootenay mines since November, is general superintendent the Rossland-Kootenay M. Co. at Rossland, B. C.

G. V. HOPKINS has resigned the management of the Bullion Extraction Works at Silica, B. C. Mr. Hopkins leaves for England this week. He is succeeded by C. M. Eye, late of Aspen, Colo.

THE annual election of officers of the California Academy of Sciences for 1903 was held at San Francisco on the 5th inst. W. Alvord was elected president, to succeed D. S. Jordan; A. Bull, vice-president; H. H. Behr, second vice-president; J. O. B. Gunn, corresponding secretary; J. W. Hobson, recording secretary; L. H. Foote, treasurer; L. Falkenau, librarian; L. M. Loomis, director of the museum; W. M. Pierson, J. F. Houghton, W. H. Crocker, C. E. Grunsky, E. J. Molera, G. C. Perkins, G. W. Dickie, trustees.

Obituary.

CHAS WESSEL, the metallurgist, died in New York City January 3, 1903. Deceased was 65 years of age.

JAMES HUTCHINSON, formerly manager of the Trade Dollar mines at Silver City, Idaho, died at Boise, Idaho, Dec. 31, 1902, of apoplexy. Mr. Hutchinson was 65 years of age and was widely known throughout the West as a mining man. For twenty years he was superintendent of the Gregory mine, in Gilpin county, Colo., and afterward superintendent of the Aspen mine at Aspen, Colo. In 1889 he was appointed State Mine Inspector for Colorado. Mr. Hutchinson was a native of Cornwall, England.

HENRY A. VEZIN died in Denver, Colo., Dec. 27, 1902, of angina pectoris. He was educated in Germany. Served throughout the Civil War in the Ninth Pennsylvania cavalry. At the close of the war he went to Colorado. During the past fifteen years he had an office in Denver, where he acted as consulting, mining and mechanical engineer. His advice on sampling and smelting machinery was much sought after. He was the inventor of the Vezin sampler. He was eminent in his profession and noted for his thoroughness in everything he undertook. The remains were taken to Philadelphia, the city of his birth, for interment.

Commercial Paragraphs.

N. B. LIVERMORE & Co. remove from 320 Sansome street, San Francisco, Cal., to the Rialto building, February 1.

THE S. S. Machinery Co., Denver, Colo., has an order for a 10-stamp mill complete, boiler, engine, etc., from the Southern Mexico G. M. Co.

ON New Year's Day, the Canton Steel Co., 1621-1639 Seventeenth St., Denver, Colo., kept open house to their friends. Refreshments were served to several hundred guests. Mr. P. P. Bush, Western manager, reports a most satisfactory business for 1902.

FAWCETT & WOOD of New York, who have been on the Comstock, have contracted with Superintendent Kinkead for one of his mills of 25-ton daily capacity, to be installed on mining property at Downeyville, Nye Co., Nev., of which they are the owners.

THE S. H. Supply Co., Denver, Colo., has recently purchased the compressor and boiler plant of Portland G. M. Co., Victor, to make room for a larger outfit, and also dismantled two electric light plants at Manitou, Colo., which they now have in their warehouse in Denver.

THE Austin Mfg. Co. of Chicago have recently installed a large crushing plant for the California Portland Cement Co., Los Angeles, Cal., consisting of a No. 3 and No. 6 crusher. The California company say that they now have the most complete crushing plant of the kind on the Pacific coast.

THE Colorado Iron Works Co., Denver, Colo., has orders for two reverberatory furnaces, 16x64 feet, for the Ohio & Colorado S. & R. Co., Salida, Colo.; one 36-inch round copper matte furnace for Tacoma Smelting Co., Tacoma, Wash.; one 5-stamp mill complete, and three Frue vanners for El Carmen Copper Co., Durango, Mexico.

Catalogues Received.

From the American Engineering Works, Chicago, is received a further installment of their handy cataloglets, on switches and trackwork, Amew hose, coupling, never-slip car movers, perfect wheels, self-oiling axles, trommel and heavy screens, any of which will be sent on request from mining men.

The Allis-Chalmers Co. of Chicago have issued Catalogue No. 5 on Rock Crushing Plants, which is up to the standard of former catalogues on this subject. It deals with rock breakers, revolving screens, elevators and conveyors, and gives sectional drawings of construction of several concentrating plants, together with much information on the subject of crushing and sizing of rock and ores.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

FOR THE WEEK ENDING DECEMBER 30, 1902.

- 717,062.—RANOE FINNER—A. A. Adams, Ebbensburg, Ariz.
- 717,063.—CONVEYER—C. J. Allen, S. F.
- 717,336.—BOTTLE HOLDER—W. E. Brown, Los Angeles, Cal.
- 717,337.—NUT THREADING MACHINE—F. P. Burnett, San Carlos, Ariz.
- 717,163.—VEHICLE COUPLING—L. H. Campbell, Portland, Or.
- 717,314.—TUBE EXPANDER—J. Carmichael, Franklin, Wash.
- 717,074.—DUMP—T. Carroll, Anaheim, Cal.
- 717,078.—MUFFLER—C. E. Christman, San Jose, Cal.
- 716,987.—EVAPORATOR—Cook & Maschke, Vancouver, Wash.
- 717,360.—SHIELDS IN CANS—W. E. Dement, Blaine, Wash.
- 717,363.—SAW—C. W. Eccleston, Centralia, Wash.
- 717,087.—GANG PLOW—L. G. Fairbank, Oakland, Cal.
- 717,089.—CELL BOX—W. H. Ferguson, San Jose, Cal.
- 717,094.—TOOTH CROWNS—B. W. Haines, S. F.
- 717,095.—DRILL—L. A. Hardison, Santa Paula, Cal.
- 717,097.—STOVE—Holmes & Hampden, S. F.
- 717,102.—SHIRT—B. Lichtig, S. F.
- 717,223.—PENCIL HOLDER—E. E. Long, Los Angeles, Cal.
- 717,233.—VAPOR BURNER—J. W. Master, San Diego, Cal.
- 717,341.—OFFICE INDICATOR—W. H. Mercer, Portland, Or.
- 717,245.—OLIVE CRUSHER—Morris & Smith, Woodland, Cal.
- 716,929.—SPEED GEAR—J. M. Ough, S. F.
- 716,930.—SPEED GEAR—J. M. Ough, S. F.
- 716,928.—SPEED GEAR—J. M. Ough, S. F.
- 717,028.—ROCK DRILL—J. H. Redfield, Spokane, Wash.
- 717,023.—ROCK DRILL—J. H. Redfield, Spokane, Wash.
- 717,120.—POULTRY ROOST—J. M. Reid, Pomeroy, Wash.
- 716,936.—STEAM TURBINE—J. Richards, S. F.
- 717,033.—SON CUTTER—C. A. Sager, Los Angeles, Cal.
- 717,230.—STOVE—F. R. Shafer, Burlington, Wash.
- 717,237.—BALLOT MARKER—T. C. Spelling, S. F.
- 717,301.—SLUICE—G. Telford, Oroville, Cal.
- 717,492.—WATER HEATER—J. F. Yoho, Seattle, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

SIDEHILL GANG PLOW.—No. 717,087. Dec. 30, 1902. L. G. Fairbank, Oakland, Cal. The object of this invention is to provide a gang plow to be used particularly upon sidehills and in which the various adjustments of the frame and plow may be effected in the simplest manner possible. It consists of a frame mounted upon front and rear wheels, said front wheels adapted alternately to serve as furrow and land wheels, connections between the axles of said wheels by which the frame may be raised and lowered, a centrally pivoted beam, standards on said beam, reversible plows turnable in a horizontal plane about said standards and the relative position of the front wheels as land or furrow wheels reversed simultaneously with the oscillation of the plow beam.

BOX TOOTH CROWNS AND ADJUSTABLE FACINGS.—No. 717,094. Dec. 30, 1902. B. W. Haines, San Francisco, Cal. This invention relates to improvements in pivot teeth and dental bridge-work. It comprises a new article of manufacture, consisting of a box or receptacle open at the top and corresponding to a tooth space and a facing secured thereto, said receptacle having means on its under side by which it may be secured to a root.

COLLAPSIBLE CELL BOXES.—No. 717,089. Dec. 30, 1902. W. H. Ferguson, San Jose, Cal. This invention relates to improvements in boxes or packages such as are designed to contain eggs, fruit or like substances; it consists in the construction of a multiple cell box or package made from a single piece of pasteboard or like material cut to the proper shape and folded to form the cells or compartments.

Latest Market Reports.

SAN FRANCISCO, Jan. 9, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22½d (standard ounce, 925 fine); New York, bar silver, 48c, refined (1000 fine); San Francisco, 48c; Mexican dollars, 38 @39c San Francisco, 38½c New York.

There is practically no change in the silver situation, though it seems unlikely that it will go lower than at present.

COPPER.—New York: Standard, \$11.25; Lake, 1 to 3 casks, \$12.25; carload lots, \$11.30; Electrolytic, 1 to 3 casks, \$12.25; carload lots, \$12.00; Casting, 1 to 3 casks, \$12.15; carload lots, \$11.10. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £52 6s 3d spot per ton.

Bi-monthly statistics show a decrease of 952 tons in stocks and 627 tons in the visible supply in London. There is an upward tendency, but it is not likely that the price will go above \$12.50 at present, as the condition of the market does not justify it.

LEAD.—New York, \$4.50; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots, 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½; pig, \$4.75. London: £11 1s 3d per ton.

SPELTER.—New York, \$4.70; St. Louis, \$4.50; London, £19 17s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c. ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$27.25@27.50; San Francisco, ton lots, 29c; 500 lbs., 29c; 200 lbs., 29½c; less, 30c; bar tin, 35c. London, £124 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 ½ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.50; large lots; London, £8 15s; San Francisco, local, \$46.00 ½ flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 34c. SOLDER.—Half-and-half, 100-lb. lots, 19c; San Francisco, Plumbers', 100-lb. lots, 16.10c.

NICKEL.—New York, 50@60c ½ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.00; gray forge, \$20.15; San Francisco, bar, 3c ½ lb., 3½c in small quantities.

During 1902 San Francisco received 28,768 tons pig iron by water. Of this 26,852 tons were foreign.

STEEL.—Bessemer billets, Pittsburg, \$28.00@30.00; open hearth billets, \$30@34.00; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$25.00@25.50
Foundry Northern 1.....	23.50@24.00
Northern 2.....	23.00@23.50
Northern 3.....	22.50@23.00
Southern 1.....	23.85@24.85
Southern 2.....	23.35@24.35
Southern 3.....	22.85@23.85
Forge.....	22.35@23.35
Charcoal.....	25.50@26.50
Billets, Bessemer.....	33.00@34.00
Bars, iron.....	1.80@1.85
Bars, steel.....	1.75@1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, boiler.....	1.90@2.00
Tank.....	1.75@1.80
Sheets, 26 store.....	2.90@3.00
No. 27.....	3.00@3.10
No. 28.....	3.10@3.20
Angles.....	1.75@1.80
Beams.....	1.75@1.85
Tees.....	1.80@2.00
Zees.....	1.75@2.25
Channels.....	1.75@2.25
Steel melting scrap.....	18.25@19.00
No. 1 railroad wrought.....	18.50@19.00
No. 1 cast, net ton.....	17.50@18.00
Iron rails.....	24.00@25.00
Car wheels.....	23.00@23.50
Cast borings.....	10.00@11.50
Turnings.....	13.50@14.00

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.30; Cut, \$3.30; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c ½ set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c ½ lb.; carloads, 24@24½c; in 10-lb. tins, 35c; sulphuric acid, in carboys, 66½ B, 2c ½ lb.; soda ash, \$2.00 ½ 100 lbs.; hyposulphite of soda, 2½@3c ½ lb.; blue vitriol, 5½@6½c ½ lb.; borax, concentrated, 7@8c ½ lb.; chlorate of potash, 12@13c; roll sulphur, 4@6c; ground sulphur, 4@6c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2@2½c; nitric acid, in carboys, 8c ½ lb.; caustic soda, in drums, 3@4c ½ lb.; Cal. s. soda, bbls., \$1.25 @1.50 ½ 100 lbs.; sks, \$1.05; chloride of lime, spot, \$3.00@4.00; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins; sulphide of iron, 9c ½ lb.; copper sulphate, 5@7c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.50; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

During 1902 San Francisco received coal as follows:

From—	Tons.
British Columbia.....	591,732
Australia.....	197,328
England and Wales.....	95,621
Scotland.....	3,000
Eastern States (Cumberland and anthracite).....	24,133
Mt. Diablo, Cal., Coos Bay, Or., and Tesla, Cal.....	111,209
Japan, and Rocky Mountains, by rail.....	47,380
Seattle, Wash.....	165,237
Tacoma, Wash.....	209,358

During 1902 San Francisco received 64,916 tons coke by water, as against 34,533 tons in 1901. Of this, about 50% came from Great Britain, 18,000 tons from Belgium and Germany, the remainder from Australia and British Columbia.

OILS.—Lined, boiled, bbl., 54c; ca., 59c; raw, bbl., 52c; ca., 57c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 48c; ca., 53c; raw, bbl., 46c; ca., 51c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 22½c; Eocene, 23½c; Elaine, 23½c; Water White, in bulk, 16c; Mineral Seal, iron bbls, 18c; wooden bbls., 20c; ca., 24c; Mineral Sperm, ca., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., ca., 23c; 86° Gasoline, bulk, 21c; do., ca., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in ca., 22½c; Lard Oil, No. 1 bbl., 95c; ca., \$1.00; Neatfoot oil, bbl., 70c; ca., 75c; No. 1 bbl., 55@57½c; ca., 57½@60c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, ca., 50@55c.

California's 1902 oil production was 13,000,000 barrels, equal to 3,000,000 tons coal. Kern county produced about 18,000 barrels daily.

RED LEAD.—One ton and over at one purchase, per lb., 6c; 500 lbs. and less than 1 ton, per lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb.; powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c ½ lb.

BORAX.—Crystal, 7c; calcined, 25c.

CHROMIUM.—(90% and over) per lb., \$1.25.

COPPER.—Sulphate, 5@7c.

MANGANESE.—(90% and over) ½ lb., \$1.25.

MERCURY.—Bichloride, ½ lb., 90c.

MOLYBDENUM.—25c ½ gramme; 1000 grammes=2½ lbs.

PHOSPHORUS.—(American) ½ lb., \$1.00.

SILVER.—Chloride, ½ oz., 75c; nitrate, 55c.

SODIUM.—Metal, ½ lb., \$1.25.

URANIUM.—Oxide, ½ lb., \$3.50.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., 04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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At What Depth Do Wet Mines Become Dry?

The question that many mine managers would like to solve is, At what depth may they expect water in the mine workings to cease to give trouble? That this important question can be determined without actual test by sinking until the desired condition is found does not appear possible. A careful inquiry into the history of deep mines throughout the world shows no uniformity in either conditions nor the quantity of water encountered in depth. It is true that there are districts where the upper levels of mines are far more wet than the lower levels, but the reverse is as often the case. The Kennedy mine, near Jackson, Amador Co., Cal., which has the deepest vertical shaft in California, and in fact all of the mines along that portion of the gold belt of California whose workings extend below 1500 feet from the surface are comparatively dry in the lower levels, although there are large amounts of water in most of them above the 1000-foot level. All of the principal shafts of Amador county are not only far below the drainage level of the neighborhood, but many hundred feet below sea level.

The shaft of the Silver Islet mine, sunken within a coffer dam on a small rock in northern Lake Superior, developed a comparatively dry mine, and yet the levels extended hundreds of feet beneath the lake. The mines of Leadville are very wet, and will always be so unless drained by tunnels. The geological conditions are such that there is little hope of finding a drier zone at moderately great depth.

The Ontario mine, Park City, Utah, has always been a very wet mine even to its lowest levels, below 2000 feet from the surface. The mines of the Comstock lode at Virginia City, Nevada, are very wet, with no indication of diminishing flow even in the deepest workings—over 3300 feet.

The mines of Pioche, Nevada, were dry to about

1200 feet from the surface, when large volumes of water were encountered which practically resulted in closing the mines. The deep copper mines of the Lake Superior region—one vertical shaft, the Red Jacket of the Calumet & Hecla Co., being nearly 5000 feet deep—and the deep inclined and vertical shafts of the majority of mines of the Witwatersrand, in South Africa, are not to be placed in the category of very wet mines. Some of those on Lake Superior are even dusty in the lowest levels.

In fact, among deep mines are found those which are extremely wet and those which are practically dry in their deepest portions; and while undoubtedly there is a point below the earth's surface where the interior heat either dries up all the moisture or turns it to steam, it is evident that this point has not as yet been reached nor even approached in

mine workings. The character of the rocks traversed by veins and the number and condition of the fissures and dikes other than veins that intersect it have an important influence on the flow of underground waters.

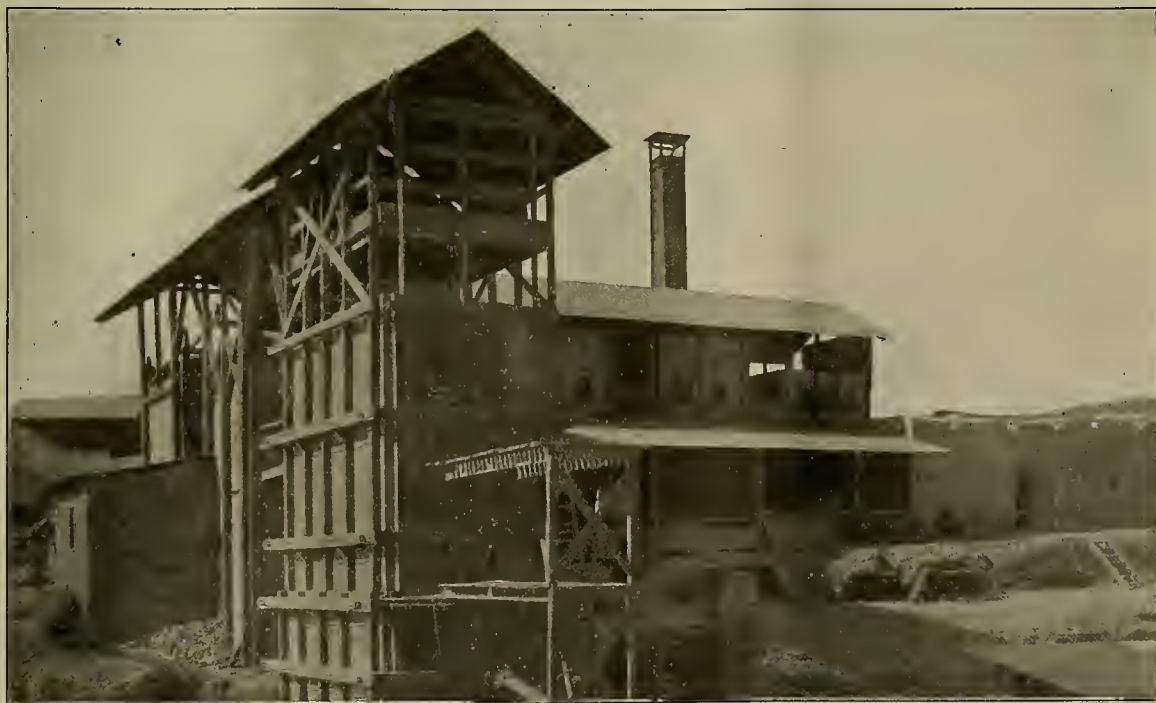
A mine after long and continuous drainage becomes comparatively dry perhaps; but let operations cease, and permit the water to rise to its natural drainage level, and then attempt to unwater the workings, and it will be found that the quantity of coming water to be handled vastly exceeds the amount flowing in normally after not only the mine workings, but the surrounding country, have been drained.

Mining in Honduras.

Honduras, Central America, is possessed of great undeveloped mineral resources, but the inaccessibility of the mining regions has greatly retarded the development of that country. There are few wagon roads in Honduras. All mining and milling machinery is packed on animals, or carried by men. The greater number and more valuable mines, so far as known, are in the interior of the country, from 100 to 400 miles distant from seaports. The mines are of various kinds, though chiefly gold, silver and copper. The most noted gold mining section is in the Department of Olancho. In that department are many gold-bearing veins, few of which are developed. Extensive placers also are found in Olancho, but these have been worked for many years. There are large beds of conglomerate which may prove on investigation to be gold-bearing, as they are in a gold gravel country. In many respects these conglomerates resemble those of the Witwatersrand. They are intercalated in red sandstones and are intersected by dikes of diabase or other basic rock. These are well exposed in the region of the Guayape and Parnal rivers, but are without development.



Lindheim & Dewees' Forty-Ton Furnace, Terlingua, Texas. (See page 39.)



Marfa & Mariposa Mining Company's Furnace, Terlingua, Texas. (See page 39.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Lindheim & Dewees' Forty-Ton Furnace, Terlingua, Texas.....	33
Marta & Mariposa M. Co.'s Furnace, Terlingua, Texas.....	33
Diagram Showing Conflicting Locations.....	37
Banded Structure in Ore, Terlingua, Texas.....	39
Train Equipped With Electro-Pneumatic System of Control.....	40
Mining and Metallurgical Patents.....	41-42
"Weber" Gasoline Locomotives.....	42
EDITORIAL:	
At What Depth Do Wet Mines Become Dry?.....	33
Mining in Honduras.....	33
Statehood for Arizona.....	34
Representation of Mining Industry at St. Louis Exposition.....	34
Advance in the Cost of Expert Service.....	34
Mining Stock Contracts.....	34
Returns of Mining States for 1902.....	34
The Industrial Growth of the Country.....	34
Advancement in Cyaniding.....	34
Agreement of Transvaal Mining Men.....	34
Petty Swindles Perpetrated on Smelting Companies.....	34
To Amend the Present Land Laws.....	34
MINING SUMMARY.....	43-44-45-46-47
LATEST MARKET REPORTS.....	48
MISCELLANEOUS:	
Concentrates.....	35
The Cripple Creek, Colo., Drainage Tunnel.....	36
The Mining Industry of the Cour d'Alencs, Idaho.....	37
Relation of Apex and Side Lines in Locating a Claim.....	37
Stamp Milling and Amalgamation of Free Gold Ores.....	38
What Is Steel?.....	38
The Terlingua Quicksilver Deposits of Texas.....	39
Electrolytic Solution Processes.....	39
Steam Shovel Excavation in San Francisco, Cal.....	40
The Recovery of Tin From Scrap Plate.....	40
Westinghouse Electro-Pneumatic System of Train Control.....	40
Mining and Metallurgical Patents.....	41-42
"Weber" Gasoline Locomotives.....	42
Experiences of a Working Miner.....	42
Improved Aluminum Methods.....	42
Rocks Passing From One Group to Another.....	42
Personal.....	47
Books Received.....	48
Commercial Paragraphs.....	48
Notices of Recent Patents.....	48
New Patents.....	48

ARIZONA should have statehood in 1903. Precedent, policy, business, good faith, all favor the creation of that commonwealth into the forty-sixth State of the Union. The Territory has the resources, population and prosperity that entitle it to statehood, and its advance in all that goes to make an American State would be the quicker therefor.

IT is hardly necessary to remind the several Legislatures of the mining States of the desirability of making proper appropriations for suitable representation of the mining industry at the coming St. Louis Exposition. This is an age of advertising, and that exhibition affords a fine chance for good advertising that will aid in the mineral development of the country. It will be money well spent for every mining commonwealth to make suitable appropriation for good display at St. Louis in 1904.

THE general advance in costs of everything purchasable is as yet not manifest in any great increase in the cost of expert service, though it is inevitable. In this regard may be noted in a general way that the price of personal service in the mining and engineering world is not at present commensurate with the quality of service required. While there has been a constant advance in the requisite technical skill and attainments of engineers, there has not been a corresponding advance in the salary paid. Particularly is this noticeable in the case of the electrical engineer, who is often expected to supply skilled service at very ordinary wages. In this, as in all other cases, "the laborer is worthy of his hire," and a position demanding the services of a trained and practiced man, in a place of importance, should have sufficient salary accompanying it. The engineering profession, whether mining, electrical, civil or mechanical, is entitled to such professional recognition.

Mining Stock Contracts.

The Supreme Court of the United States has decided in the case of Otis & Co., plaintiffs in error, vs. E. A. Parker, defendant in error, that section 26 of article IV of the constitution of the State of California is not unconstitutional. This section is in reference to dealing in lotteries and stock gambling on margins, and declares that the buying of stocks on margins in stock boards, exchanges or markets, or a contract for stocks to be delivered at some future time is illegal and all such contracts shall be void. All contracts for the sale of shares of the capital stock of any corporation or association on margin, or to be delivered at a future day, shall be void, and the money paid on such contracts may be recovered by the party paying it by suit in any court of competent jurisdiction. This law is aimed directly at the stock brokerage business, as carried on in the exchanges of San Francisco, but it is an open question to what extent it may affect dealings between the directors of mining companies and subscribers to the stock of such companies. A great many mining companies in California are organized on the progressive plan, wherein those desiring to become interested in the enterprise agree to pay stated sums at regular intervals—usually monthly—until the entire sum agreed upon in the contract shall have been paid, when the secretary of the company issues a certificate entitling the subscriber to a given number of shares of stock in the corporation. Previous to this time the subscriber holds only a certificate, contract or agreement, which sets forth the terms under which the subscriber shall be entitled to shares in the company, but he is not in the meantime an actual stockholder in the company. From the language of the statute it may readily be seen that this method of disposing of mining shares may come directly under this decision of the supreme court.

THE returns for 1902 are nearly all in for the mining States. The result is moderately satisfactory. Among the most noticeable features is that the base of the metal mining industry is what is called the "low-grade proposition." Few indeed, and noticeable because of their fewness, are the "high-grade propositions." It is the many thousands of low-grade producers that make up the bulky figures for 1902. It is in them that lies the greater profit. And it is mining and scientific progress that has made such profit possible. It is only by close economy and skillful operation that the most of the low-grade producers can afford employment or reason for continuous operation. Upon these rests the prosperity of the mining industry, a base that is dependent in its turn in a larger degree every year upon the knowledge and ability of the miner and metallurgist. What is required of the mining engineer who is placed in charge of most large properties in these days is not that he shall know how to make a rich mine pay, but how to make a low-grade mine pay. He must be familiar with every device, mechanical and otherwise, that will cheapen cost, and the men most in demand are those who have demonstrated their ability to engineer low-grade properties at a profit. The equipment of new property is no longer a haphazard matter. It is not hastily planned, but all the details are carefully studied out and comparisons made before final decision is arrived at. The object is to reduce labor, and labor means expense. To increase capacity during a stated time (and time is money), and this whether in the mine, the mill, cyanide works or smelter; mechanical underground haulage; thoroughly equipped shafts; complete and well-arranged metallurgical works, all tend to reduce expense, and are features of well-equipped and properly managed mining enterprises.

THE industrial growth of this country is strikingly exemplified in the one case of electrical progress. In the single item of electrical construction and repairs, which is but a small detail of the amount represented, it is of note that in 1850 there were two establishments in the United States for supplying electric appliances, with a total capital of \$3750, and a product valued at \$5100. In 1902 there were 1938 such establishments, with a capital of \$95,684,376, and an output valued at \$116,984,743.

Advancement in Cyaniding.

The cyanide process was first successfully introduced in America about 1890, though it was known as early as 1806 that gold was soluble in a solution of potassium cyanide. L. Elsner in 1844 published the results of investigations made by him on the reactions of various metals in an aqueous solution of potassium cyanide. From a comparatively small beginning and a stage of great uncertainty the process has developed into commercial success, and plants are now in operation in America having capacities reaching to 1200 tons daily. While it is still true that the adaptability of any untried ore to the process is an experiment, the methods of determining whether any particular ore is amenable to cyanide treatment have been reduced to an exact science, and there are now few gold ores that cannot be made to yield up a large percentage of their values, though this may involve preliminary preparation in the way of crushing, grinding and sometimes roasting. The process, as practiced to-day, has been evolved from a long series of experiments, mostly made by men entirely competent to make them, and it is a story of hope, failure and final success. These men have given freely of the knowledge thus gained, publishing not only the results of their experiments, but the methods pursued, in detail. It is not the outcome of one man's knowledge or effort, but that of all engaged in the investigation and practice of cyaniding gold ores. Very material changes have been made in the mechanics of the process as well as in its chemistry, and while the process of to-day seems to have approached perfection, there is no doubt that the future will see its broader and still less expensive application.

UNDER the agreement between the leading mining men of the Witwatersrand and Colonial Secretary Chamberlain, it is understood that the Transvaal mines will guarantee the interest on \$300,000,000, half of which is to be devoted to public works, while the other half will constitute a war contribution to the government. This is considered in London an equitable adjustment of the matter, and now that uncertainty has been removed renewed activity in the mines of the Rand may be looked for. The labor question has become a serious one, however, as the mines cannot work at a profit without cheap labor. The bringing of large numbers of natives from Uganda, on the east coast, has been considered, but owing to the difficulties experienced and anticipated in this direction it is now thought the Imperial Government will consent to the importation of Chinese laborers for the mines.

ADVICES from various points indicate that smelting companies are making determined effort to break up the petty swindles occasionally perpetrated upon them. At Northport, Wash., the smelter company has been the victim of a gang of thieves who have stolen matte worth from \$3.50 to \$6 per pound, one of them, who was arrested, having about 200 pounds of the stuff in his possession. This was just an ordinary case of stealing. At Val Verde, Arizona, the company has had difficulty with some of its customers, who are accused of having scientifically salted their ore, in raising the value of samples of a carload of ore to the amount of nearly \$2000. But the salting was not done scientifically enough, as the smelter's employes, by accurate processes of sampling and assaying, were able to detect the over-values.

SECRETARY of the Interior Hitchcock has a bill before Congress to amend the present land laws that is of sufficient merit to warrant endorsement. It is in the interest of the forests of this west half of America, and if it passes will place all public forest lands under a proper system of protection from fire or destructive lumbering. The proposed repeal of the timber and stone land law is a little too radical a remedy for timber frauds and despoilation, but the bill fostered and presented by the Secretary of the Interior will afford adequate protection to the mining and manufacturing interests, and also stop speculation in forest reserve scrip. The bill partakes of a form of remedial legislation that deserves endorsement.

CONCENTRATES.

It was long since determined that battery screens inclined outward at the top facilitated discharge.

ECLOGITE is a fine-grained granular rock, consisting of red garnet in a base of grass-green smaragdite (a thin foliated variety of amphibole).

"OIL OF GOLD" exists—in the brains of fanciful men, but nowhere else. "Oil of gold" in its nascent state is in close connection with the tangible effect of a chimera revolving in a vacuum.

ANY coining U. S. mint will give gold coin for gold bullion, the only charge being for the necessary copper to make the 900 fine alloy, or for parting should the bullion be below 900 fine.

AIR entering the cylinders of an air compressor should be as cool and pure as possible, as the lower the temperature of the inlet air the greater the efficiency, and the warmer the air the greater the loss.

THE fact that two or more rock quarries are located in the same district does not signify that the rock taken from each has equal value as a building or ornamental stone. Often there is a wide difference in quality.

IT has been claimed that petroleum has been successfully solidified for ocean transmission, and E. J. Hoffman of Chicago is said to have made satisfactory transatlantic shipment of solidified oil, but the accounts seem to lack verification.

PROSPECTORS will probably get better average results in searching for veins or deposits containing gold, silver, lead, copper, zinc and tin than in looking for rare minerals which usually have an uncertain and frequently changing valuation.

IN the case of Shattuck vs. Costello, 68 Pac. Rep., Arizona, 529, it was decided that other mining claims may properly be used in a mining location to designate the boundaries of the claim, as it is a sufficient reference to natural objects and permanent monuments to comply with the statute.

GARNETS of brownish color and resinous luster are sometimes mistaken for zinc blende. The great difference in hardness—garnet 6.5 to 7.5 and zinc blende 3.5 to 4, and in specific gravity, garnet 3.1 to 4.3 and zinc blende 3.9 to 4.2—should serve at once to distinguish them apart. A drop of nitric acid on pulverized zinc blende will evolve fumes of sulphuretted hydrogen. Garnet fuses easily before the blowpipe, while zinc blende is difficultly fusible.

THE oxidized zone in veins and ore deposits is produced by the alteration of the original deposit through atmospheric agencies and drainage. In some mines the oxidized zone ends abruptly, the ore changing within a foot from an oxidized to a sulphide or normal condition. In many others the ores change by imperceptible gradation from the oxidized to the sulphide condition. This latter condition is not uncommon where the sulphides are encountered before the water level is reached.

IN the case of the Alaska United G. M. Co. vs. Muset, 114 Fed. Rep., U. S., 66, it was decided that where a corporation owning two mining plants has a general superintendent, with a general oversight over both plants, and a foreman of each mine, who employs and discharges the men, and directs and controls the entire operations of his mine and of the various gangs of men there employed, such foreman is a vice-principal, for whose acts and negligence in the conduct of such mine the owner is responsible.

IN extracting copper from ore assaying 2.5% Cu it is common practice to mix about 200 pounds of salt with 2000 pounds of ore, that quantity being about 107 pounds in excess of what is theoretically required by the copper. A ton of ore assaying 25% Zn would require theoretically about 900 pounds pure salt, or 1000 pounds if the same excess were used as in copper extraction, but in all likelihood an excess would be needed, as a considerable portion of the lead would likewise be converted into chloride, soluble in hot water, insoluble in cold.

THE best height of discharge, the best screen to use, the proper amount of water in the battery, the height of drop of stamps, and grade of plates are all things that must be determined by practical experiment. The motto "get all the capacity possible" is a good one when coupled with "get all the gold possible." The exact point where these two should meet must be determined by the good sense of the mill man or the superintendent. When it costs 10 cents per ton more to save an additional 5 cents per ton from the tailings the point of greatest economy has been passed.

THE latest method of hardening the face of armor plate is by heating the face with electrical currents by means of large carbon anodes instead of applying the heat in a furnace. It has been found that during the

electrical treatment a portion of the carbon of the anodes enters into the composition of the steel, producing great hardness of that metal. The depth to which the hardening proceeds is regulated by the length of time during which the treatment is applied. It is claimed to be superior to the Harvey system or that of Krupp. By the latter process plates require fifteen to twenty days treatment. With the electrical method the desired result is accomplished in five hours.

A GERMAN SCIENTIST, H. Jansen, N. W. 7, Dorotheen Str. 49, Berlin, Germany, is now essaying the very task suggested by our Mexican correspondent, viz., a technolexicon; a dictionary of all technical terms used by French, German, English or American engineers, so that the compilation shall contain equivalent words and expressions in all three languages. The general idea is commendable, but two obstacles readily suggest themselves: First, To what limits shall go the definition of the word "technical?" second, No matter how circumscribed, these limits may be the manifest magnitude of the task and the apparent impossibility of accurate progress except by a systematized and extensive collaboration.

MONAZITE is an anhydrous phosphate of cerium, lanthanum and didymium. In color it is light yellow, honey yellow, reddish, brownish or greenish yellow, with a resinous to vitreous luster, and is translucent to sub-transparent. It is brittle and is 5 to 5.5 in hardness. It is only obtained by sluicing the sands and gravels and never by rock mining, as the mineral occurs usually in small disseminated grains, though crystals of monazite have been found in a dike at Mars Hill, Madison county, N. C., which were 1½ inches in length. These occur in a pegmatite dike. Gold frequently is found in regions where monazite occurs. It is then recovered as a by-product in placer mining for gold. Monazite has not been reported in California as yet. It is usually found in regions of granite and its gneiss and schist.

THE fact that the ore shipped from the district shows less value per ton than it did five years ago does not necessarily imply decreasing values. It may mean, more likely, that increased treatment charges and decreased transportation charges enable ore to be mined and shipped that formerly would not pay for handling. It is not uncommon for mining districts now to ship annually thousands of tons of ore that ten or even five years ago would have been left in place as worthless. The increased tonnage, of course, decreases the average, and superficial figures may make it seem that ore values are decreasing; but it may be that the fact is where 10,000 tons of \$50 ore were shipped that now 200,000 tons of \$30 ore go out, the aggregate being \$100,000 more for the district, even though the average per ton value might seem much less.

IN the Knox system of blasting employed in quarrying, reference to which was made herein in the issue of Dec. 27, 1902, it is sometimes considered necessary to cut at either side of the holes drilled V-shaped notches to render the rising of the rock more certain in the desired direction and also to expedite the process. At the Raymond granite quarry, Madera county, Cal., two holes drilled 8 inches apart, but not having the V-notches cut in the line of fracture, have been known to split the granite in a true vertical plane for a distance of more than 60 feet and to a depth of 20 to 25 feet to the next underlying joint plane. The block of rock between the joints in this quarry are of great size; one measuring 360 feet in length, from 4 to 6 feet high at the ends and 25 feet thick in the middle, and exposed on the surface for a width of over 60 feet, all without a single crack or flaw. It is in rock of this character that the Knox system works to the best advantage.

THE capacity of a stamp battery depends upon a number of factors, and no constant can be given. Things which affect capacity are weight of stamps, height of drop, number of drops per minute, kind of screen employed and superficial actual space of discharge, height of discharge, and quantity of water used in the battery. The width and length of the interior of the mortar also has an important bearing on this matter. In addition to this no fixed set of conditions is ever maintained for any considerable period, as the wearing down of the die increases the height of discharge, which is again adjusted by inserting a lower chuck block. The weight of the stamp is variable by reason of wearing down of the shoe, the height of drop constantly increasing, unless the taps be reset to equalize it. Besides these few things the character of the ore is a very important factor in discharge. A flinty, flaky ore will not discharge through a round aperture as rapidly as through a slotted screen. A hard but easily crushed brittle ore will discharge more rapidly than a soft, spongy ore that will clog up the screens, etc.

CHROMITE, or chromic iron, occurs in a number of States, notably Pennsylvania, Maryland, North Carolina and California. It occurs only in the peridotites and allied igneous basic magnesium rocks or in serpentine which results from an alteration of these rocks. It always occurs as pockets or hunches of irregular extent, often the solid ore graduating by almost insensible degrees into the surrounding rock mass. Where chromite is mined there are often large quantities of the low-grade ores left standing in the mine or thrown out on

the dumps. Ordinarily, on exposure this material disintegrates rapidly and a high-grade product can be obtained by simply sluicing, the gangue being washed away, the chromite filling the riffles. The chief use of chromite is in the manufacture of chromate and bichromate of potash. It is also employed in the manufacture of hard, tough steel, particularly shoes and dies in rock crushing machines and stamp mills. The standard ore must contain 50% chromium oxide, and must be low in silica. It is sometimes used in lining furnaces for smelting copper and other ores, for which purpose it is superior. Bricks for this purpose are made of a mixture of chromite, bauxite and milk of lime. The mineral is well adapted to this use, as it is infusible, does not become friable when heated and cooled, and is not attacked by the acids or gases arising from smelting of ores.

CRYOLITE is fluoride of sodium and aluminum, and in appearance resembles ice. It occurs in great snow-white masses which are partially transparent. Its hardness is 2.5 and it has three cleavages. It is obtained exclusively from Ivigtok, in Greenland, on the Arksuk Fjord. The cryolite occurs as a large bed in a granitic vein in gray gneiss. It is limited to the granite, the richer portion being about 500 by 1000 feet in area. Associated with the cryolite in small amounts are quartz, beautiful crystals of iron carbonate (siderite) and galena, with smaller quantities of sphalerite, pyrite, chalcocopyrite, and wolframite. Surrounding the richer portion of the cryolite mass is a zone of quartz, feldspar and a variety of muscovite mica. Besides these there are fluorite, cassiterite (tin oxide) and arsenopyrite. The line of demarcation between the cryolite and the outer zone is clearly defined, but the outer zone passes gradually into the granitic mass. The cryolite is mined in a cut 600 feet long, 200 feet wide and 100 feet deep. Ships' cargoes have been obtained containing 99.5% pure cryolite. It is employed chiefly in the manufacture of sodium and aluminum salts, and more sparingly in making hydrofluoric acid. It is also used to a limited extent in the manufacture of an opalescent glass resembling porcelain. Cryolite has been discovered in small quantity in El Paso county, Colo., at the southern base of Pike's Peak, and in the Yellowstone National Park.

URANIUM and vanadium are in some demand, chiefly for experimental purposes. They are also employed in limited amount in steel manufacture. The chief sources of uranium are uraninite, gummite and carnotite, the latter containing considerable vanadium. The principal sources of uraninite are at the Wood, Black Hawk and Kirk mines, near Central City, Gilpin county, Colo., and on Dolores river, 80 miles west of Dolores, Montezuma county, Colo. It has been found at Paradox valley in Montrose county, Colo. In South Dakota it is found in small green scales incrusting the siliceous ores of the Ross-Hannibal mines in Ruby Basin, and on a porphyry mountain west of Terry's Peak, in Lawrence county. Carnotite is found on La Salle creek, southwest of Paradox, Colo. The mineral contains 47.654% uranium oxide, and 15% to 18% vanadium oxide. Vanadinite is lead vanadate, and is found in quantity in mines of Arizona and New Mexico. It was particularly abundant at the Vulture and Phoenix mines in Maricopa county and at the Mammoth mine, Pinal county, Arizona, and at Toke valley, Sierra county, New Mexico. Uranium and vanadium are employed in making ferro-alloys of these metals. They increase the tensile strength and toughness of steel to a remarkable degree. Thus far, however, it is only the product of laboratory experiment, no steel having been made with these metals in commercial quantities. Colorado is the principal producer of these minerals.

THE principal source of molybdenum is molybdenite (MoS₂). It is usually found in foliated masses or in scales with perfect basal cleavage and bright metallic luster. When crystallized it occurs in short or flat hexagonal prisms. It is very soft, 1 to 1.5 in the scale of hardness, of pure lead gray color. Molybdenite and graphite are often mistaken one for the other, but molybdenite is more metallic looking and has a bluish-gray cast. Its streak on paper also differs from that of graphite, the latter making a dull black streak, the former bluish black. Before the blowpipe, the best test, molybdenite gives forth sulphur fumes (sulphur dioxide), while graphite remains unchanged, giving no fumes when heated. Molybdenite occurs in scales in granite, gneiss, syenite, granular limestone and in quartz veins. In California it occurs in numerous localities, one important one being in Mono county, 12 miles northwest of Bridgeport. At this place it occurs in a large vein of vitreous quartz. Molybdenite is also reported in Alamo mountain in Ventura county, Cal. It is found in a vein 8 to 15 feet wide. Other occurrences are reported from Washington, Utah, Arizona, New Mexico, Montana and Alaska. The principal uses of molybdenum in recent years has been in the manufacture of certain chemical reagents, especially ammonium molybdate, used in determination of phosphoric acid. Also in the preparation of "blue carmine" for coloring porcelain. It is also employed in steel manufacture. Molybdenum is sold as the metal and as a nickel-molybdenum alloy. The quotations on molybdenite are variable, from 10 cents to \$1.10 per pound. To be marketable the ore must contain over 45% molybdenum and be free from copper. The amount used is limited, and the market could easily be oversupplied, with a consequent reduction in price.

The Cripple Creek, Colo., Drainage Tunnel.

Written for the MINING AND SCIENTIFIC PRESS by
W. B. WILSON, C. E., Colorado Springs, Colo.

The difficulties connected with handling the water in the deeper mines of Cripple Creek district have to some extent been exaggerated, and by constant iteration and reiteration in the newspapers of varying ideas on the subject, mostly by laymen totally unfamiliar with handling water, it has begun to assume the appearance of a very large bugaboo. For the benefit of your readers who are not familiar with the Cripple Creek district, it may be roughly described as located in an area of low, rolling hills, which lie between Pike's Peak and the Arkansas river, the extent of the district being approximately 2½ by 3 miles. For some years after mining operations began, the camp was generally considered to be a dry one, most of the mines then operating being located rather towards the tops of the hills. The first water encountered was in a short tunnel on the Blue Bell property in Squaw gulch, opposite the Mary McKinnie mine, and at an elevation of about 9500 feet, and as the water in this case came out with considerable force, showing a head of water back of it, the existing ground water level was probably 50 or 60 feet higher. As the various shafts over the western half of the district were gradually sunk to this elevation, it was found that each in their turn began to encounter a considerable quantity of water as soon as they commenced opening up their water levels. Fortunately, at about the same time, a tunnel formerly known as the Moffat, which was being driven into Gold Hill, got into water and helped that much towards draining the ground, some 2500 to 3000 gallons per minute flowing from it for some time.

Following this tunnel, another known as the Standard, at an elevation of 9031 feet, near the lower end of Beacon Hill, which had been extended into the phonolitic core of the hill, also began draining the water, and from late in 1898 until May, 1901, a very large stream of water—as much as from 3000 to 5000 gallons per minute—poured from this opening. The drainage effected by this tunnel was immediately noticeable over the greater part of the district, not only in the pumping shafts, but by the drying up of the Moffat tunnel shortly after the Standard began flowing.

There is nothing unusual or different in the water occurrence from that in other camps. The quantity to be pumped does not approach in amount that encountered in Leadville, and with the important difference that in the case of Cripple Creek, located in a comparatively arid region, with a total annual precipitation of only about 6 inches, the addition by saturation to the underground water is comparatively trifling. In Leadville, situated in the heart of the main range, where the snowfall is heavy in winter, and with hard summer rains, a constant addition is being made to the underground flow, and a cessation of pumping by the mines would mean a return to the original elevation at which water was encountered. In Cripple Creek the drainage of a vertical foot of water means just that much less to be pumped, as the annual increment from surface water is practically nil.

It has unfortunately been the case that during the drainage of the deeper pumping shafts in the western half of the district—where, on account of more or less openness and porosity in the north and south veins and connecting cross fractures, the elevation of the water has been practically the same in all of them—that when one got below the level of the other with its pump station, and began opening up the ground, it immediately had to pump more than its share, with the result that it was found to be too big a contract for any one mine to carry through. If it had been the case, as in Leadville, of a great many shafts all pumping at the water at the same time, and the cost distributed among many, we would have heard very little from any of the mines on the subject. In the case of the Elkton, which made probably the most determined and gallant fight of all, it was principally a case of biting off more than they could masticate that caused most of their trouble. The shaft had been sunk from 600 to 800 feet, where the pump station was cut out and large pumps installed, and later work began in opening up the veins in the 700 and 800 levels simultaneously. A sudden influx of a great volume of water from a cavernous opening in the south level on the 700-foot drowned the pumps at No. 8; the subsequent recovery of these by means of sinking pumps being a slow and costly process, it was only accomplished by first fighting the water back into the seventh level and bulkheading it, and by putting in another bulkhead in No. 8, when that level was finally recovered. These cement bulkheads served their purpose admirably, and permitted the drawing off of the water in such quantities as could be readily handled by the station pumps; but, even then, handling as they did some 2000 gallons per minute for many months, the cost was prohibitive in the extraction of medium and low-grade ore at any profit.

The steps which have been taken by the Mary Mc-

Kinnie, El Paso and Elkton mines toward the driving of a comparatively short drain tunnel to intersect the El Paso shaft at 585 feet depth, or 230 feet below the present water level in the deep shafts of the district, are steps in the right direction; but the matter should not be allowed to rest with the comparatively small amount of drainage which will be effected by this tunnel. It will be well to hear in mind that even when the tunnel has been driven into the water-saturated area and drainage begun, there will be a long period of waiting for the water to subside, or until the water will be drawn off to the tunnel level. Residents of the district will remember that, although the Standard tunnel begun draining in 1893, it was not until 1901, during which period the Elkton, Mary McKinnie, Doctor-Jack Pot and, for a considerable part of the time, the Moon-Anchor, were steadily pumping, that complete drainage was finally effected. The recession of the water, as noted in the Moon-Anchor during the time when pumping was being carried on most vigorously, and the Standard at the same time discharging its largest volume of water, was only about 1 inch per day; so that it is evident that, even after this proposed tunnel begins draining the water, a considerable period of time must necessarily elapse before some of the deeper mines will be able to resume sinking and opening up their working levels to the depth which will finally be drained by this tunnel.

Knowing that drainage at the best is extremely slow, it would be wise on the part of those providing funds for the completion of the first tunnel to at the same time make an effort to raise an additional amount for the purpose of beginning another and longer one to drain to a greater depth of from, say, 300 to 500 feet. Then, while the first was performing its duty, and during the waiting period, the second could be completed and share with the first one in giving more rapid action on drainage, so that by the time the ground above the first was worked out a greater depth free of water would be awaiting them.

It has been urged as a reason against the driving of a tunnel at great depth that it is possible that the water zone may not be of great thickness, and that there would be a probability of the tunnel penetrating dry ground, and, consequently, being of no value. A great many arguments can be made, both pro and con, on this subject, various writers on the genesis of ore deposits and the circulation of underground waters having widely diverging opinions, quite a number leaning towards a belief in a comparatively limited thickness in the zone affected by circulating waters, while many of our latest and best American writers give by far the greatest burden of proof in favor of very deep circulation in most cases. The mineralization in Cripple Creek has so manifestly been aqueous and caused by circulating ground water (or solutions) that there is no room for argument as to its origin; the question as to how deep it will go is mere theorizing. It is not meant to be implied that the now existing waters caused the deposition of minerals, or that a diminution of the quantity of water would mean a lessening of the mineralization, but it is an indication of the permeability of the veins and dikes to great depth; thus, 800 feet in depth at the Elkton shaft would correspond to 1900 feet at the Isabella, or about the depth that those arguing against deep circulation assert is the limit beyond which it can not exist.

This much has been demonstrated, that in many of the deeper mines, as the Portland, Vindicator, Ajax, Last Dollar, Golden Cycle, Gold Coin, Strong, Blue Bird, Wild Horse, Elkton, Mary McKinnie, El Paso, Gold King and others, there is as yet no sign of impoverishment in the veins; but, on the contrary, not only has the grade of the ore held its own, but there has been a very marked increase in the extent of the mineralization of the veins and dikes at depth, as compared with nearer the surface, the apparent lower average grade of the ore now shipped from the district being caused by increased tonnage from the mines and less discrimination in assorting.

A very good argument against one well-known writer's views on the subject of deep circulation is to be found in Cripple Creek. He strongly questions the circulation of water at all at great depth, and, among other arguments against the permeability of rocks, cites, as an instance, "that standing water in abandoned shafts is strong evidence of the impenetrability of rocks." The very fact that abandoned shafts are so generally filled by surface water also establishes that, while it ran in there, it carried with it a certain amount of clay and silt, which would naturally, after repeated fillings, close up small crevices and capillary openings and would have a tendency to make it watertight. It does not seem like a good argument for his side of the question. It was frequently noted that when it was necessary to close the bulkheads in the Elkton mine that the pressure gauges affixed thereto indicated very shortly after they were closed the exact height, within a few inches, of the standing water in the district and that the closing of these bulkheads was immediately noticeable in the Doctor-Jack Pot and Mary McKinnie, 1 mile distant, by an increase in their water flow. It is difficult to believe that, after the water is drained from a level in one of those mines, it could have been so wet, as they very often seem more than usually tight and hard and lacking in vugs and

cracks; yet when they were on the water level the water seemed to come out as if squeezed from a sponge through every pore, and from the natural cleavages in the basalt and phonolite as if from a syringe, and yet there was no opening that was visible to the naked eye.

Although it is more than likely that at greater depth the volume of water may diminish on account of the cessation of some of the shallower and lower fissures and the closing by sedimentation and pressure of capillary openings, causing a slower flow of the water into the mine workings, so far there has been no evidence whatever of decrease in the volume of water, nor in the area of the brecciated mass, in which the greater number of the producing mines are located. It is probable, however, that at great depth the water will percolate so slowly it will not be difficult to dispose of it by pumping when the mines get below that portion to be drained by a tunnel or tunnels.

The water question, although a grave one as a matter of course, will not be looked on as so serious after the first drain tunnel has been driven, and it is a comparatively small affair; but another should not be started or driven on too small a scale. The larger and longer the opening the greater the drainage, on the same principle that an oil well will flow more oil after it has been torpedooed than it did before, and the cost of excavating a larger opening is more than made up by the greater facility offered for faster work. The Newhouse tunnel, at Idaho Springs, some 2½ miles in length, was driven proportionately much cheaper than other tunnels in the State of smaller dimensions, plenty of room for the drill men and the handling of the broken rock being furnished in the liberal opening of 12x12 feet in the clear, the cost per foot, according to the superintendent's statement to the writer, being only a few cents over \$19.

When the immensity of the issue at stake is taken into consideration, when one stops to think of the greatness of Cripple Creek's contribution to the world's visible gold supply, some \$120,000,000 in gold already produced from an average depth in the larger mines of less than 700 feet, with every promise that a still greater amount will be produced by an added depth, it seems strange to the outside world—to those holding stock in some of the deeper mines, but with no say as to what shall be done with their property—that the directors and managers of these mines have been so dilatory in taking steps to inaugurate a system of drainage which will solve the problem for all time. The pumping system has been tried and found wanting; the enormous cost accompanying it has been found prohibitive in the production of medium and low-grade ores at a profit, and mine owners now generally recognize that tunneling is the easiest and best solution, the more especially as very great depth can be gained in a comparatively short distance.

During the time when the Elkton Company were having their hardest fight with the water, they engaged a competent engineer to make a complete report for them as to the advisability of continuing pumping operations. His investigations, covering a period of several weeks, and conducted with unusual care in securing data on the subject, lead him to believe that the volume per vertical foot, as indicated by the various records of the pumping mines, and the flow of water from the two tunnels—the Moffat and Standard—which greatly aided the drainage, varied from a maximum of 107,000,000 gallons to a minimum of about 40,000,000 gallons. He was inclined to believe that the volume of water showed signs of diminishing quantity per foot as depth was gained, although the greatest amount was indicated as existing some 40 to 50 feet above the present water level.

Assuming that 40,000,000 is approximately the number of gallons per vertical foot, the cost of unwatering the next 100 feet over the district would be as follows: Forty million gallons, at 8½ pounds per gallon, equals 166,666 tons; taking the rate of 4 cents per ton of water pumped, as is estimated to be the average Leadville cost for a similar average height to be pumped, this would imply \$666,660 as the cost of pumping out the next 100 feet, and, as pumping works by a sort of inverse ratio, the cost going up as the shaft goes down, there would need to be a very large decrease in the quantity of water to be pumped before taking off very much from these figures.

The committee having in charge the negotiating with the various mining companies for funds sufficient to complete the first tunnel have had a great many difficulties to contend with, the principal one of all being the indifference of many of the mining companies, whose property will be benefited and greatly enhanced in value when drained to great depth; all of them are perfectly willing that the tunnel should be driven, but preferably at the expense of others, and they have generally taken a very narrow view of the situation.

Can any one doubt that the driving of even this first tunnel will not give a new era of prosperity and an added value to every mine on the west side of the district which has a vein on their property—that the very fact that many of the former dividend-paying mines that have freely expended hundreds of thousands of dollars in draining the water to its present level will be again able to resume dividend paying—

that this will not give an added impetus to mining in Cripple Creek?

Why should there be such a strange hesitancy in doing what everyone is persuaded is the right thing to do? Why delay month after month in beginning action when everyone knows that the non-solution of the water problem is the only cause for the present state of depression, not only in the mining stock market, but in actual mining operations in the camp as well?

The Mining Industry of the Cœur d'Alenes, Idaho.*

NUMBER III—CONCLUDED.

By J. R. FINLAY, Colorado Springs, Colo.

USE OF WATER POWER.—All the mines make more or less extensive use of the water power of the region. An enterprise is now on foot to supply any deficiency of power by means of a 90-mile electric transmission from Spokane Falls. It is expected that, in view of the high cost of coal, this will prove cheaper than steam power. Practically all the power from the neighboring streams is now utilized for running mills, generating electric power and compressing air.

At three of the principal properties elaborate water power plants have been installed, but, by reason of the variation in the water supply during the year, each plant is, to a greater or smaller extent, supplemented by steam power.

At the Tiger-Poorman mine, on Canyon creek, electric power, generated by water power, is used for pumping on a large scale. The pumping station is more than 1500 feet below the surface, and the pumps raise the water through that distance in one lift. The plant consists of two independent pumps, which can be run either by steam or electricity, or both. The steam engines are 18x30x36 inch cross-compound condensing engines. The electric motors are each 200 H. P., alternating, 40-cycle, induction motors, using a current of 2300 amperes, which is brought down the shaft to the machines by a 2½-inch submarine cable. The pumps are geared, have 4½x36 inch plungers, and flywheels 16 feet in diameter, which carry 30-inch belts. These pumps have effected a vast economy in the operation of the mine. They raise from 400 to 1200 gallons (averaging about 500 gallons) of water per minute.

The Morning Mining & Milling Co. employs in exploitation a well-planned power system, most of which is used for making compressed air. The water is gathered from various streams high up on the mountains above the compressor site, and conveyed to the wheels by three pipe lines of 1400, 1200 and 140 feet head, respectively. The 1400 and 1200-foot heads are delivered by separate nozzles on a Pelton wheel 32½ feet in diameter. The 140-foot head is used to drive two 11-foot Pelton wheels, one on each side of the big one and on the same shaft. There are two compressors, one on each end of the water wheel shaft. They have 18x32½x42-inch cylinders, with intercoolers. The air is compressed to 28 pounds in the low-pressure cylinder, and delivered by the high-pressure cylinder at 90 pounds. Running at full speed, these machines compress about 6000 cubic feet of free air per minute. The pipes which convey this air to the mine cost more than the machinery. They comprise 9200 feet of 12½-inch pipe to No. 6 tunnel, at which point the air is divided into two lines of 9-inch pipe, one entering No. 6 tunnel, which will be 2 miles long, and another leading 4½ miles to No. 5 tunnel.

The Bunker Hill & Sullivan Mining & Concentrating Co. also uses water power to help run its large compressor at Kellogg.

MILLING.—The process employed is substantially the same at all the mines, and consists of coarse crushing and separation by jigs. Most of the ores contain the galena in segregated streaks of practically clean material, which separates under crushing and is easily caught. The difficulty increases greatly when the galena is intimately mixed with iron carbonate, zinc blende and quartz. Such ores require much finer crushing and the use of a greater number of vanners, buddles, shaking tables, etc., to separate the slimes. The following description of the process at the Standard mill will serve as a concrete example of the best current practice:

The crude ore from the mine is dumped from railroad cars into a bin of about 600 tons' capacity, whence it is fed by gravity to a No. 5 Gates crusher, which reduces it to something over 1 inch diameter. From the crusher a 15-inch belt conveyor carries it to another bin, whence it passes by gravity to the roughing rolls, which reduce it to pieces of ½ to ¾ inch diameter. From the roughing rolls it is elevated to a double set of trommel screens, which size it into an "oversize" of more than 15 millimeters diameter, and into sizes which pass through 15, 10, 7 and 3-millimeter screens. The fines which pass the 3-millimeter screens are not jigged, but go at once to V-hoxes or hydraulic classifiers. The slimes passing over the V-hoxes go to settling tanks, where the heavier material is caught and sent to Wilfey tables and Frue

vanners. All the tailings from tables and vanners, together with the overflow from the settling tanks, go to a "canvass" plant of fifty-two tables of 6 square yards each. Material caught on the canvass tables is reconcentrated on two Wilfey tables.

Returning to the coarse material classified by the trommels, the oversize—or what passes over the 15-millimeter screens—goes to the coarse or "hull" jigs, and what passes through the 15, 10 and 7-millimeter screens goes to finer jigs.

Part of the tailings from the coarse jigs is retained as "middlings," to be further treated, and part is allowed to go directly to the creek as worthless. The middlings thus saved are passed through fine rolls and then to Huntington mills, which reduce the pulp until it passes a 40-mesh screen.

The finer jigs—i. e., the 15, 10, 7 and 5-millimeter jigs—also select a percentage of the middlings, which are likewise passed through fine rolls, in three sets, according to the coarseness of the material. Thence this material passes to the middling jigs, which take out some clean ore. All of the tailings from these middling jigs are reground in another set of Huntingtons to 40-mesh. All the material ground by the Huntington mills goes to the Wilfey tables and Frue vanners with the slimes from the settling tanks and V-hoxes above described.

This mill concentrates about 500 tons of crude ore per day. Its machinery consists of the following: A No. 5 Gates crusher; two 15-inch belt conveyors; six sets of 15x26-inch belt rolls; four 5-foot Huntington mills; twenty-eight Hartz jigs, arranged in fourteen pairs; two lines of trommels; an "oversize" trommel for middlings; four elevators; eighteen Wilfey tables; three 4-foot Frue vanners, and fifty-two canvass tables.

Power for the main mill is derived from two Pelton wheels, one of 4 feet diameter under a 32-foot head, and one of 6 feet diameter under a 235-foot head. A third (24-inch) Pelton, under a 235-foot head, runs a dynamo for electric lighting, and a fourth runs the Gates crusher.

TRANSPORTATION.—The transportation of crude ore to the mills is a problem of considerable importance to all the mines except the Tiger-Poorman, the Frisco and the Crown Point, each of which has its mill at the place where the ore reaches the surface. The ore from the Standard, Hecla, Mammoth and Empire State is hauled to the mills by the Northern Pacific and Oregon Railway & Navigation Co. railroads, which reach the mines, and do the work for a reasonable price. The Bunker Hill & Sullivan has a Bleichert tramway about 2½ miles long. The Morning Mining & Milling Co. has a railroad of its own, several miles long, built on a 7% grade, and operated by means of Shea geared locomotives. It has proved very successful, hauling the ores to the mill for less than 10 cents a ton, inclusive of delivery of all timber and other supplies to the mine.

The cost of transportation varies from 8 to 20 cents per ton at the various mines.

PROGRESS AND PROSPECT OF DEVELOPMENT.—It is reasonable to expect that the Cœur d'Alene district will be able to maintain its present—and perhaps an increased—output for many years to come. Within the past two years three new properties have been opened up and brought to the dividend paying stage, while several others have shown more or less ore, and are likely to develop satisfactorily.

The Hercules, which is the latest discovery of great importance, promises to become a mine of the first rank. This vein is at the upper end of Canyon creek, high on the side of Tiger peak. Near the surface the lead values have apparently been destroyed by leaching, but at the depth of some 400 feet the ores are found to be very rich both in lead and silver. This is a good instance of that reconcentration of values near the surface which is beginning to be recognized by students of ore deposits as an important feature in the value of many metal mines.

Up to date the Hercules has not reached the point of concentrating its ores, but ships them crude, at a handsome profit.

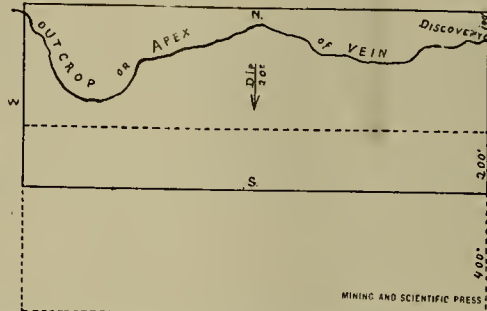
In the Mammoth mine the ore almost invariably lies in a single streak in immediate contact with the fissure. The shear zone is much narrower than elsewhere, and the mining is simpler, in that no filling on an extensive scale is required. All the material broken is sent to the mill as concentrating ore. The timbering consists entirely of stull sets, with 6-foot posts, instead of 8-foot, as in the Standard. The chutes are built of planks, instead of the cribbing which is necessary when the stopes are filled.

At the Tiger-Poorman, Hecla, Frisco and Morning mines all the stoping is done with stull sets, about as in the Mammoth. Very little effort is made to sort the ore before concentrating, or to fill the stopes systematically. It is an open question whether it would not pay better to give more attention to sorting and filling, and less to timbering. With closer sorting the concentrates might be obtained by the milling and transportation of less material, and, as an additional advantage, the stopes would be left in a safer condition.

THE eighty-third meeting of the American Institute of Mining Engineers, being the thirty-third annual meeting, will be held at Albany, N. Y., beginning Feb. 17, 1903.

Relation of Apex and Side Lines in Locating a Claim.

Although the United States statutes usually state clearly the requirements of law in the matter of locating, holding and patenting mining claims, it seems to have left some in doubt as to their rights in the matter of the relation of the apex to the side lines. The following is in explanation and answer to a question of an Arizona correspondent: A locates a claim and takes the full statutory dimensions—600 feet by 1500 feet—but for reasons probably satisfactory to himself takes 100 feet on one side of the discovery point and 500 feet on the other side. Subsequently B, noticing this unusual proceeding, encroaches upon A's claim, and appropriates 200 feet by 1500 feet of it to form a portion of a new claim. The relative position of the conflicting locations, the position of the discovery shaft, and course of the outcrop of the vein are indicated in the accom-



panying sketch. The claims are laid out in an east-west direction, the dip of the vein being to the south. B's claim is indicated by the dotted lines, showing encroachments upon the claim as staked by A.

A's discovery point is seen to be at the extreme east end of his claim and to be upon the apex of the vein. The question arising is, did A make a legal location and can B legally dispossess A of a portion of his claim?

"Lindley on Mines" says, Sec. 364: "There can be no question but that the Act of July 26, 1866, as well as all subsequent legislation by Congress, contemplates that the location shall be made along the course or strike of the lode." And in Sec. 366 the same authority says: "The primary function of the side lines is to connect the opposite extremities of the end lines, and to complete the enclosure of a surface within which is found the apex of the discovered lode. As the width of the location is fixed with reference to the middle of the vein, the law contemplates that this must be ascertained by actual exploration and development, and cannot be assumed to be in an unexplored position."

"Where the vein outcrops at the surface there can be no question as to the point from which the lateral measurements must begin. When the discovery shaft develops the vein at some distance below the surface, and the locator does not determine by any further development that the nearest actual surface point is elsewhere, and the fact does not otherwise appear, the land department has ruled that, for executive purposes, the middle of the vein as disclosed in the shaft will be assumed to be the point from which lateral measurements are to be calculated."

Then follows a paragraph having a direct bearing on the question in point. It reads as follows:

"According to the regulations of the department, lateral measurements cannot extend more than 300 feet on either side of the center of the vein. Hence 400 feet cannot be taken on one side and 200 on the other; but if, by reason of prior claims, the full width allowed cannot be taken on one side, the locator will not be restricted to less than 300 feet on the other."

It is evident from the above that A did not make a legal location, and B had a right to take for himself all that had been taken by A in excess of 300 feet on the south side of A's discovery shaft. The law does not presuppose a prospector to be a civil engineer, and requires him to so locate his claim that his side lines shall be at all times about 300 feet distant from the center of the vein. Owing to the dip of many veins, and the uneven topography of the country, this may necessitate an elbow in the claim, but this is permissible if the end lines are parallel. The law permits the locator to have 1500 feet along the strike of a lead, the distance being measured horizontally, and does not require that the measurement be made along the line of a sinuous outcrop.

A's claim will stand 400 by 1500 feet, he losing the additional 200 feet on the south side, but it is not apparent that this loss will in any manner affect the value of the location in so far as it refers to the vein upon which discovery was made, as A is entitled to extralateral right and can mine his vein to his south side line and underneath B's location—and beyond, if he cares to. It is presumed that B also has made a discovery of a vein on his claim. Should B's vein by reason of steeper dip be found to unite with A's vein in depth, A would take both below the point of convergence, as A's location is senior to B's.

*Trans. Am. Inst. Min. Eng.

Stamp Milling and Amalgamation of Free Gold Ores.

Written for the MINING AND SCIENTIFIC PRESS by DANA HARMON, San Francisco, Cal.

I have been asked to revise and amplify a paper on stamp milling which I read before the Technical Society of the Pacific Coast in September, 1900.

It has never been my intention to write a text-book on milling—the field has been well threshed—but merely to reduce to writing some of my own thoughts and experiences in the hope that out of it some profit would spring to me at least. The very act of writing benefits by crystallizing the, perhaps, vague thought into concrete expression, and discussion does of itself tend to clarify. I had my own grave misgivings. Could anything new be said? There was no gain in giving the old ideas a new dress. From one point of view talk seemed idle—a species of assault and battery on the other man's good nature. Millmen are usually sure they are doing the right thing. But travel will prove up all sorts of methods, much guessing and rule of thumb, ruts deep and many. Experimenting has caused me to change methods and so may it, too, other men.

After weighing the matter, the best course seemed to be not to argue out all the details, but to whittle close, and yet to give some reasons. It is very clear to me if we could get a series of papers from the busy superintendents who are actually doing and studying, telling us what they are doing and why, that there would in a few years be built up a valuable literature on milling. The thought and effort of one man would stimulate another, so that in the long run the superintendents and also this now respectable business of mining would be benefited.

It is not at all the literary man—his text-book, or his account of everybody's work, with no sorting out of the good from the bad—that we are in need of. Let those who can get out in the open and give us a plain tale from the hills. The superintendents will come near turning out the genuine article. They are not academic. The chronicler must always precede the historian. Let the superintendents tell us what they are doing and let each read the other man's story.

Gold mining is the only business where it is impossible to offset increased costs of production by adding to the price of the finished product. It never suffers from competition, but it does suffer from ignorance as to what its traffic will stand, and from incompetent management. Fear of competition holds back many a manufacturer from disclosing his trade secrets. But in gold mining there can be no such fear and free discussion advantages all.

Quite as important is it to catch the gold as to find the ore. In these low-grade days a superintendent should be a milling man as well as an underground man. Mining has gotten down on all fours with any other business. To the capitalist there is no essential difference between a cotton mill and a quartz mill. The girl at the loom does not run the loom. No more should the battery boy decide how to amalgamate his ore. A superintendent should not have to run to and fro hunting for a "good millman"—he should be able to make one out of raw material.

In the smaller mills (not over 100 stamps) the actual load at the mine, both underground and on top, is upon the shoulders of the superintendent. When working on close ore margins, the difference between dividends and failure will turn upon the skill of this one man, who knows the ins and outs of every phase of his business. Many of the millmen, standing their twelve-hour shifts, are doing conscientious and excellent work. But it is not to be expected that these, toiling hard every day and tired out at night, can find time to study, to think, to compare. This is the duty of the superintendent. Daily toil, iteration and reiteration, dwarfs and dulls the human brain. Small wonder that so many millmen are "set in their ways." Rightly have these men disregard for the opinion of a superintendent who is manifestly beyond his depths in the mill building, and who can only fume over a poor cleanup. These same millmen will accept new methods from a live superintendent, who they can see is trying to reach the best results. The West is full of superintendents who don't know as much about the mill as they should, who are content to draw salary but won't think.

We learn to discard notions which were once holy as though from the Koran. Out of the din and hammer of the stamp mill there has come to me certain definite conclusions touching mortars, tables, mill construction and amalgamation. I believe that there are certain fundamental principles which underlie the treatment of all ores falling within the lines of my caption. The local variance which must be had for ores of different districts are mainly those of screen and water, matters determinable by assaying the tailings.

CONSTRUCTION.—Without going into the details of mill construction it may be well to note some points bearing upon the work to be performed. Millwrights are seldom millmen, and it will usually occur that the \$10 millwright will set small store upon the opinion

of the \$3 millman. Too much stress can not be laid upon the necessity for substantial work, especially on heavy stamp mills.

MILLSITE.—A millsite should be selected so as to permit: (a) plenty fall from track to concentrator floor (60 feet will do but 90 is safer); (b) straight-line tracks if possible, certainly no sharp curves; (c) additions to mill readily made.

There is often economy in original construction and also in operation by banking the mill directly against the mine head gear. But this is poor economy. In some States, on account of the danger from fire, the law wisely forbids buildings at the mine opening, so as to avoid the danger from suffocation underground.

It is also cheaper to put the rock breakers inside the mill building, but it is a vicious practice. Rock breakers make dust and should therefore be entirely separated from the mill building. The question of dust on the cams is worth considering. It will be found that with the same power applied to the line shaft, stamps dropping say ninety-three per minute in the morning, immediately after oiling up, will drop eighty-seven to ninety in the afternoon owing to dust on the cams and bearings—this dust arising from running rock breakers inside the mill building. This difference will vary as the ore going to the breakers is wet or dry. It may be noted in passing that clean quartz from even a wet stope is dry enough to throw out clouds of dust from the breaker.

Another point is the slope of the ground at the millsite. It is not always practicable to have exactly what is best. But a little foresight will save expense in the long run. A 20° slope fits well, gives minimum grading costs, and insures plenty of light behind the batteries. Having a choice between 15° or 30°, take the former. A level plain is not bad—necessary if it is a large mill with batteries back to back. The expense of elevating crushed ore to the bins by skip or belt conveyor is trifling. Upon ordinary mountain roads a 5-foot cut at the back finds solid rock or stiff subsoil. This is just about what a 20° slope affords.

A 20° slope will minimize the grading by having a 5-foot cut at the back line of the concentrator floor. This insures solid foundation for the wall usually erected between the battery and concentrator floors. With a rock outer wall the intervening space of the concentrator floor can be rock filled and finally cemented.

Where the pulp is to pass from the tables to the concentrators, the vertical distance from the lower end of the battery floor to the concentrator floor should not be less than 22 feet. This is a detail often overlooked. It is always best to have a classifier before the concentrators, and some of these require 12 to 14 feet head room. Moreover, launders use up grade fast at the rate of 1½ inch per foot.

BACK KNEE FRAME.—I prefer the back knee frame because of its solid bracing to the ore bin, the tapets are in plain sight, the pull of the belt is downward, it requires less lumber, and the plates are well lighted. A flat bottom ore bin will strengthen the anchorage and bracing of the battery frame. True, it retains constantly a large quantity of rock; but it is a phenomenal mine that does not yield enough poor ballast. The constant slide of ore on a sloping bin bottom tends to crowd the entire structure forward.

One objection that the line shaft is subjected to dirt need not be. Set the base of the mortar 6 feet above the top of the mudsills, instead of 3½ or 4 feet, as is customary with contractors. This will give plenty of head room around the shaft and pulleys. Tight wood boxes encasing the shaft for its entire length will keep out dirt, and will minimize the danger of accident to the man oiling the bearings. Plank or cement this mudsill floor. Whitewash every post and wall; oil cups on bearings. We often see a ¼-inch pipe leading from the feeder floor down to the shaft boxes. This is a lazy man's folly.

In figuring on power the uncertain factor is friction, and if bearings are to be saddled with dirt and gum, as in the dark they surely will be, power is wasted. There is a good bit of the personal equation in friction. A more serious objection to the placing of the line shaft—as is ordinarily done in back knee frames—underneath the feeder floor is the heavy strain on the cam shaft belt. This causes frequent delays to relace the belt. On this point note a suggestion below, which seems to me practicable, viz., rope driving.

MORTAR BLOCKS.—There are still radical differences of opinion as to the relative merits of concrete or wooden mortar blocks. The use of concrete is increasing, but it is undeniable that there are instances where the concrete has been blown out and replaced with wooden blocks—replaced either because the concrete crumbled or induced excessive crystallization of nuts, bolts and stems. It is not possible to ascertain the exact cause of failure. It may have been faulty construction. Nobody cares to talk about his failures, and it is but human nature that the superintendent will not be eager to fling out upon the outer wall any extra editions reciting his repair tribulations. One man would save an excavation by building up a concrete pier set practically on top of the ground. Another would save on quality of cement. The third—a novice at mixing—would put in the concrete too dry, relying upon tamping, and therefore

inevitably left fatal interstices in the mass. So that, while it may ultimately be proven that concrete is the best material for a mortar block, nevertheless with it, as with wood, the details of construction must be carefully worked out. It took years to find out that vibration tends to move the wood block mainly in a direction parallel with the line shaft. The wood block must not only be set on a firm base, but it must also be tamped all around with the utmost care, so as to keep it in place.

It has been the custom to insert a gasket between the mortar and the wooden block—rubber, canvas, blanket or paper. In the earlier concrete blocks the same practice was followed. Probably, when analyzed, the value of the gasket lay in the protection it afforded to the wood. It was put in as a cushion for the mortar where none was needed, but it operated practically and, without our realizing the fact, merely as a protector to the wood. Concrete does not need such protection. Logically, if one builds of concrete there should be no gasket under the mortar. At the North Star mill the mortar rests directly upon the granite cap, without any gasket, and the superintendent reports the mill working with entire satisfaction.

All things considered, the concrete block may be said to be in the evolution state. It does not rot. Neither does a first-class wooden block short of twenty years. This cement block will be improved. There have been already enough failures with them to teach the lesson that they must be constructed with care.

Anchor bolts 6 to 8 feet long, instead of 30 to 40 inches; the base of the mortar wide enough to admit of the bolt being inserted after the mortar is in place; pockets in the concrete so that a new bolt can be slipped in; cast iron cups to receive the battery posts, set on a level with the bottom of the mortar (see North Star mine plan as shown in the MINING AND SCIENTIFIC PRESS for March 22, 1902); a cap piece to the concrete is advisable and granite is cheaper and better than cast iron; the concrete must be laid in wet, so that the voids will be filled (this is an especially important point); use only the best of Portland cement; three parts sand to one part cement will give a strong mortar for rubble masonry, and also for broken stone concrete on all except the top layer, when the proportion should be changed to two of sand to one of cement—these are some of the points which readily suggest themselves. Weighing, now, the whole question, my own conclusions are as follows:

First—The chief objection to the concrete, that its rigidity induces excessive crystallization, can be overcome by a composite block—concrete to the ground line and capped with wood. It would be durable, permitting renewal of the woodwork at reasonable expense. The great advantage of the concrete block is that the mill can stand idle without deterioration, which most decidedly is not true of the wooden block.

Second—The jar of a 1100-pound or 1200-pound stamp is so much greater than that of an 850-pound stamp that one should not assume certain success for the former based upon a concrete success on the latter.

Third—A sufficiently durable wooden block can be constructed. I have never heard of one being blown out because it had failed to turn off good work.

Fourth—For every mine the local conditions should control the choice. Costs of material, the probable life of the mine, etc., should be considered. There is no use of an everlasting foundation on a ten-year mine.

Fifth—A potent cause of crystallization is due to bad construction of battery frame, posts and sills. With any block there should be especial attention paid to this frame construction. There is no wisdom in putting a house carpenter at framing battery timbers. Carpenters are all right on the mill building.

(TO BE CONTINUED.)

What Is Steel?

We are all familiar with the name, but how many of us if asked this question could answer with any degree of certainty? It is necessary to define the term "steel" at some length, since the old classification very inadequately describes the modern cast, malleable compounds of iron, carbon and metalloids used for structural purposes and constituting at least three-fourths of the metal now made by steel processes.

The old term "steel" referred to the cast malleable product of iron and so much carbon that the metal would harden when beated to redness and thrust in water. The homogeneity of the metal is, however, an equally distinguishing quality, and is due to its having been poured into a mould when in a fluid state, so that the slag might separate by gravity, and the metal might become solid and crystalline.

Wrought iron, on the contrary, while having similar chemical properties, and sometimes as much carbon, consists of pasty masses from which the slag is rarely quite expelled by the pressure that sticks them together. It is, therefore, laminated in structure.

As the soft compounds and those varying in chem-

ical constituents came gradually to be produced by casting processes, it was natural and convenient to enlarge the term "steel" to cover them, and the use of the term was at the same time rendered legitimate and scientific by basing the classification on one of the grand characteristics—structure due to casting—rather than on ingredients, as heretofore, especially since structural qualities were constantly increasing in importance. It has been found practically convenient to distinguish between all the cast malleable compounds, whether hard or soft, by affixing the name of the metal incorporated, such as chrome steel, manganese steel and the like, or the percentage of carbon, or both. It is important to know the amount of carbon in structural steel, and this is readily determined.

It will thus be seen that the grand structural characteristic of steel to which it largely owes its value for all uses is homogeneity due to fusion; also that its chemical constituents and characteristics due to them are various.

The important chemical qualities of tool steel are: First, the tempering quality, which is due to the presence of 1% to 1½% carbon and its mechanical mixture with the metal by means of slow cooling from red heat. This makes the metal comparatively soft, so that it may be cut by ordinary tools, but upon reheating and suddenly cooling it becomes extremely hard, owing to the carbon remaining chemically dissolved in the iron. Second, freedom from such ingredients as phosphorus and sulphur, which induce brittleness.

Except some modern steels in the manufacture of which nickel, manganese and the metalloids are employed, the best tool steels have but a few hundredths of a per cent of any other ingredients except carbon, silicon and iron.

The terms "pot steel," "crucible steel," "Bessemer steel," etc., are used only to distinguish processes of manufacture, and do not necessarily differ chemically or mechanically.—G. E. Wolcott in *The Aurum*.

The Terlingua Quicksilver Deposits of Texas.*

Written by B. F. HILL, Geologist.

Within the last five years a new industry has sprung up in Brewster county, Texas, which has added materially to the value of the output of metals from that State. Reference is made to the quicksilver mines of the Big Bend of the Rio Grande, in the southwestern part of Brewster county.

The belt that may be designated as mineral bearing is approximately 15 miles long and 4 miles wide, the greatest length being east and west.

While it is not probable that all the paying mines will be found within this area, it will be within this district that nearly all the development of the near future will take place.

The rocks of the area may be divided into two classes, those of sedimentary origin and those of igneous origin. The rocks of the igneous class may be subdivided into those which came into their present positions in the molten state and those which, though of igneous material, have been laid down in beds, as volcanic ash and tuffs. These latter are important only on the outskirts of the district.

Except for minor unconsolidated deposits of recent origin, all the sediments in the district are marine, although they indicate that the conditions under which they were deposited varied to a considerable extent, as there are deep sea and shallow water deposits, with many intermediate varieties.

The sediments belong to two periods, the Cretaceous and the Tertiary. The Cretaceous section is extensive, and has representatives of both the Upper and Lower divisions. The total thickness of the Cretaceous is in the neighborhood of 2000 feet, while the Tertiary, with the volcanic tuffs and ashes, represents several hundred feet more.

THE IGNEOUS ROCKS.—In three localities upon the Terlingua uplift the igneous rocks cut the Lower Cretaceous limestones. In two of these instances, that of California hill and Clay mountain, in the vicinity of Terlingua postoffice, they occur as old volcanic plugs, whose upper portions have been eroded. Both these plugs are flanked by the limestones and shales of the Buda and Del Rio formations. These rocks have been locally metamorphosed on the contacts, slaty cleavage having been induced in the shales. The third instance of volcanic material within the bounds of the uplift is that at Black mesa. It is probable that here the volcanic material never penetrated the Lower Cretaceous, as in the cases mentioned, but formed a laccolite between the Edwards limestone and the overlying beds. Black mesa owes its existence to this intrusion.

A common type of structure in the Upper Cretaceous area of Terlingua creek valley is the lava capping of the sediments. In some instances the mass of lava upon the sediments is several hundred feet thick. It is in the capping that the only quicksilver in igneous rocks has been found.

The rocks most commonly encountered belong to

two strongly contrasted groups, viz., a series of basic basaltic rocks and a more extensive series of acidic rocks, including phonolites, andesites and rhyolites.

RELATION OF VOLCANIC ROCKS TO THE DEPOSITS.—Although the existence of the deposits of quicksilver depends on the presence of volcanic rocks, the relations are indirect. The deposition of the ore was dependent on the presence of hot springs, which were undoubtedly caused by the volcanic rocks. As pointed out by Prof. Becker (Monograph XIII, U. S. G. S., p. 417), such springs are most likely to occur at a very moderate distance from lava, but several miles may intervene. In the Terlingua district all the deposits are within a short distance of volcanic rocks of some nature. In only one case is the cinnabar actually associated with the volcanic rock directly, but its deposition undoubtedly took place subsequent to the flow of the volcanic material.

THE ORE DEPOSITS.—The mining operations that have been carried on in the Terlingua district have been practically all on the surface. The ore has been found along certain lines that bear definite relations to the structure of the rocks, and in masses that seem to have no visible definite relationship to the rocks or to other deposits. There are distinctly defined calcite veins that contain large quantities of quicksilver ore, while contiguous parallel veins of precisely the same general character may not carry a trace. Masses of brecciated limestone and iron-stained clay material may carry large quantities of cinnabar or may be completely devoid of it. The position of the

thread and spread out several feet. The cinnabar is generally near the center of the vein, but stringers extend not only through the calcite to the walls of the veins, but sometimes for short distances into the country rock.

The iron associated with the calcite and cinnabar in the fissure veins is always in the form of the oxides, when the wall rocks are the Lower Cretaceous series. In no instance was undecomposed pyrite found in veins in these formations when cinnabar was present. Veins in the Del Rio clay often carry considerable pyrite, but no cinnabar is present, nor does a careful analysis of the masses of pyrite reveal the presence of the metal. The oxides are both limonite and hematite, crystalline and amorphous. They are often accompanied by oxides of manganese. The fillings of the fissures are generally confined to these materials. Sometimes, however, masses of clay are encountered in the vein. The clay often contains finely divided native mercury, but more often it is barren of the metal.

METHODS OF MINING.—The methods of mining employed in the Terlingua district have been up to the present simple and crude. The machinery in use is confined to picks, shovels, drills and sledges. Windlasses are used in the shafts, few of which are over 20 feet in depth. The deepest shaft in the field was about 80 feet in August, 1902. The material was hoisted to the surface in rawhide huckets upon the backs of the Mexican miners, who climb the notched poles or chicken ladders with great agility.

The location of the vein is generally determined by



Banded Structure in Ore, Terlingua, Texas.

deposits is influenced by the system of faults already mentioned.

The deposits in the neighborhood of Terlingua postoffice, which include the workings of the Marfa & Mariposa Co., the Terlingua Mining Co., the Colquitt-Tigner Co., and numerous small prospects belonging to various companies or individuals, are all in the limestones of the Upper Cretaceous.

FISSURE VEINS.—There are several types of deposit carrying the quicksilver ore in the Terlingua district. The most usual one is the vein filled with calcite gangue carrying cinnabar and the iron oxides. These fissures are of variable width and linear extension, but taken altogether are the most persistent of all the forms of deposit. The veins of this type are in two systems, having courses at right angles to each other. The northeast-southwest veins are the most productive of quicksilver, those normal to this series rarely carrying even a trace of the metal. In most cases the fissure is practically vertical, although slight dips have been observed.

The filling of the vein is largely calcite. Usually a distinct banding arrangement is visible, the bands differing in color, size of crystals, and amount of iron and cinnabar present. Generally in the calcite veins the cinnabar is in crystalline aggregates, but amorphous masses are sometimes present in connection with the crystalline variety. Vugs frequently occur in this type of vein. A common variety is made up of an exterior shell of limonitic material with an interior lining of calcite crystals, generally of the dog-tooth spar variety. The crystals of spar are thinly coated with small crystals of cinnabar, causing the appearance of solid crystals of cinnabar. In no case has the cinnabar been found actually crystallized within the calcite, but the calcite crystals are often filled with iron-colored material.

From the Excelsior vein masses of almost pure cinnabar weighing several hundred pounds have been taken. The veins are by no means uniformly rich. Often the ore-bearing streak may diminish to a

trial workings of surface material in a horn spoon.

After the cinnabar has been found in a vein its course is traced by shallow pits along it, from which washings are taken. The veins are generally narrow, often less than 1 foot. But, whatever the width, the usual custom is to excavate a pit from 3 to 8 feet in width along the course. Portions of the excavated material showing cinnabar are thrown into separate piles, according to the apparent richness. In the open cuts along the veins one object has been the opening up of the ore to sight. In view of the irregularity of the deposits, and the liability of the ore to disappear, this method has been a useful one. The deposits are assumed to continue in depth, but no important attempts have yet been made to prove it.

In addition to the open cut method of following the vein, the ore is obtained by the method of drifting along the course of the vein from the shallow shafts. Tunneling has been carried on in a few instances where the topography has been favorable, but a large proportion of the ore has been obtained from workings open to daylight.

(TO BE CONTINUED.)

In metallurgy electrolytic solution processes are in use or on trial for the more valuable metals, such as copper and nickel. The reaction between chlorine and metallic sulphides at high temperatures brings the whole domain of sulphide ores under sway. Thus a sulphide, say argentiferous galena, is treated with chlorine, which gives off the sulphur as sulphur, which is condensed and sold, the lead uniting with chlorine, making chloride of lead. The silver is extracted by stirring with a little lead, and the fused salt is then electrolyzed, yielding pure desilverized lead and chlorine. The process is self-contained, yielding sulphur, lead and silver. It is especially applicable to mixed refractory ores which have been nearly valueless, though plentiful. These reactions have been proved on the large or ton scale, and there is no technical difficulty.

*Extract from Report of B. F. Hill in Bulletin No. 4, University of Texas.

Steam Shovel Excavation in San Francisco, Cal.

Written for the MINING AND SCIENTIFIC PRESS by
R. P. McLAUGHLIN.

During the past year excavation has been carried on by the Santa Fe R. R. Co. in the vicinity of the China Basin, San Francisco, Cal. Nearly the entire eastern half of a hill has been removed by a cut. The highest bank is 175 feet, the length of cut a quarter of a mile, and the average width about 600 feet. The total volume to be extracted is approximately 1,500,000 cubic yards.

The material to be moved is what is locally called greenstone. It is much faulted and crushed, being mostly serpentine and altered rock. The only breaking process to which it is subjected is that resulting from blasting, which seldom leaves pieces greater than a cubic yard in size.

The shots are placed in holes 10 to 15 feet from the edge of the bank and about the same distance apart. Dynamite is the explosive used. Drilling is accomplished by steam power. Three portable boilers furnish the pressure. Coal is the fuel used by all the boilers on the work, with the exception of one, which uses oil. The steam is carried by 1½-inch pipe to a power drill using an X-shaped bit. Two men attend the boiler and steam and three are required to move and set up the drill. The blasts do not interfere with other work, simply caving the bank and scattering little debris.

The cut has been made in three steps, the shallowest being on the upper side of the excavation. A steam shovel works in each of these smaller cuts alongside a temporary track. The shovel stands on a short track which is extended forward by 8-foot lengths as the bank is cut away, the track being removed from behind as the machine advances. This track is laid on the ground or upon cribbing as occasion demands. A half circle of about 15 feet radius represents the area cut away by the shovel at one setting. In operating the shovel three men are required. One controls the raising and side swinging motions of the scoop, another lengthens and shortens the arm to suit the depth of the cut, or the distance to the bank, and also opens the bottom of the scoop for dumping. The third man acts as fireman. Several men are employed to clear obstructions from the track and move the shovel.

Two trucks similar to those of an ordinary freight car carry the shovel. Side displacement of the forward truck is prevented by tension braces fastened to the platform, and to foundations set about 4 feet from the track, and an equal distance in the ground. The tendency of the shovel to be pushed back is resisted by locking back of the wheels, and by clamps fastened to the rails back of the forward wheels.

The machines used are of three sizes, viz: forty-five, sixty and eighty tons. The largest machine is used in the upper cut, the smallest in the lower cut, the third machine doing duty in the middle cut. The capacities of the dippers of the three shovels are respectively 3½, 2½ and 1½ cubic yards, and average amount of earth removed per ten-hour day by each is 2000, 1500 and 1000 cubic yards.

The 65-ton shovel is fitted with a 25 H. P. boiler and has two engines attached, the larger engine of which does the lifting and swinging, the smaller doing the thrusting.

The "greenstone" has proved to be very trying on shovels, frequent repairs and reinforcements being necessary. The scoops are of steel, the body plate of the 65-ton machine being 1½ inch thick and the several points about 6 inches square. These parts have been badly worn, and almost entire renewal of the scoop has been necessary. Frequent renewal or reinforcement has been needed in the beams and bracing of the forward parts of the machines.

The excavated earth is hauled about a mile by rail to where China Basin is being filled for railroad yards. Five trains have been in use. Grades are often uneconomical, owing to their having to conform to those of the streets along which the track runs.

Two styles of cars are in use, wooden and steel. The former are the smaller, having hoxes about 10x10x2 feet, being mounted on four wheels. These cars dump by the releasing of a chain on one side which allows the box to tip to the opposite side. The righting of these cars can be done by hand when empty. A train of these cars usually comprises sixteen cars with a flat car partly loaded at the end. The latter serves to ballast the train, and also acts as a brake, none of the small cars being provided with them. The lightness of these cars necessitates the track being kept clear of rock which falls from the cars during loading. The chief advantages of the wooden cars are low cost, durability and ease of repairing. They are unprotected by patents. These advantages seem to make the cars best fitted for this sort of work.

The larger cars are of steel and are 30x10 feet. Their weight is about twenty-five tons and the carrying capacity stated to be forty tons. Usually eight cars are taken in a train. Air is the power used for dumping, and also for the brakes on each car. The car is divided by a cross partition into two compartments. The dumping gear is arranged to allow any or all sections of the car to be dumped at

once. The bottom of the car is formed by swinging sections which meet at the center of the car and are drawn to place before loading by a steam derrick. The plates slope down over the trucks from the pointed bottom, forming a guide for the falling earth during dumping. This shape of car raises the center of gravity of the load higher than in a flat car with similar trucks. The strain on the trucks is consequently great, and on rough temporary roads, such as are here used, breakage of wheels is frequent.

The steel cars have not proved best suited to this work, as necessary repairs are frequent, more troublesome and costly than on wooden cars.

Another excavation of less magnitude is being made by the Southern Pacific Co. on the western side of the hill. One small steam shovel and considerable hand labor is employed. The earth is hauled a quarter of a mile to the north by gravitation. The system used is simple and its application elsewhere may prove of value to mining men.

The cars have hoxes of 2-inch planking about 5x3x2 feet which dump to one side by the releasing of a latch on the opposite side. The cars are provided with four cast-iron 12-inch wheels. A car near each end of the train of seven has a brake which is



Train Equipped With Electro-Pneumatic System of Control.

applied by standing on a lever that projects at the end of the car.

A 1-inch cable wound on a 30-inch drum is fastened to the cars and descent is controlled by a hand brake on the drum. Four cars loaded with rock run on a track parallel to the main haulage way. This train of four cars is pulled up by the loaded train running down, and when allowed to descend it pulls up the empty cars. There is a turnout and double track midway of the system where trains pass.

A ½-inch cable is attached to the dummy train. The part of the drum taking the dummy cable is about 24 inches diameter. Cast-iron sheaves with 4-inch face and diameter of 3 feet catch the cable on the curves while wooden rollers 18 inches long and 6 inches diameter are placed along the track to prevent the cable from dragging on the ground. The fall is about 75 feet in a quarter of a mile.

The Recovery of Tin From Scrap Plate.

The tinned iron is placed in a receptacle whose walls consist of a stronger electro-positive metal than tin, e. g., iron. According to a Swedish patent of B. A. Bergmann of Nyfors, this receptacle is filled with caustic alkali and also contains a depolarizer, such as cupric oxide. An electric current results, while at the same time the tin is separated in the form of alkaline stannate. When the alkali lye is saturated with the alkaline stannate, a current of carbonic acid is immediately introduced into the solution. Thereby the tin separates in the form of stannic hydrate. This combination is treated with acid, and from the resultant solution the tin is finally obtained electrolytically in metallic form.—Neueste Erfindungen und Erfahrungen.

THE air resistance to the rotation of a flywheel may cause a considerable loss of energy. A 450 H. P. engine, direct-connected to a generator, has a flywheel with channel-shaped arms. The tests were made by using the generator as a motor, driving the flywheel up to a normal speed. It required 13,300 watts to rotate the wheel and shaft, but by inclosing the arms in a sheet-iron casing the wheel was driven by an expenditure of 9874 watts. The saving effected by use of the shield was 5.7 H. P., or 1.2% of the power of the engine.—Scientific American.

Westinghouse Electro-Pneumatic System of Train Control.

The Brooklyn Elevated Railway Co. has given an order to the Westinghouse Electric & Mfg. Co. for 210 multiple train-control equipments to be used for the operation of electrically propelled trains on its lines. In order to reduce dead weight and to obtain higher tractive effect when starting it is better to place driving motors on the trucks of several of the passenger cars of a train, taking advantage of the weight of the cars, than to put the motors on a locomotive, which must be artificially loaded to give it the necessary adhesion. The company has also purchased 150 equipments which have been in satisfactory operation for nearly a year.

The Westinghouse multiple train-control system, developed by George Westinghouse, it is claimed is well adapted for the operation of trains under everyday conditions. The system involves the use of compressed air for moving the current controlling apparatus, electro-magnetic valves governing the admission of air to the controlling cylinders and low voltage electric circuits running from car to car for controlling the action of the magnetic valves. The connections for the low voltage circuits are the only ones which have to be established between the cars of the

train, no air connections being required outside of the ordinary brake hose. A complete equipment for each motor car consists of two or four electric motors, a controller similar to controllers used on ordinary street cars, and one or two motormen's controlling switches, from any one of which all the car controllers on the train may be operated. The car controller consists of two drums which revolve in bearings, and stationary contact fingers which make contact with points upon the revolving drums. The large, or main drum, opens the main circuit and makes the motor and resistance combinations; the small drum reverses the motors.

The control circuit is isolated from the main power circuit and is not affected by a momentary interruption of current due to ice and sleet on the rails, or other causes. With the low voltage current, grounds and short circuits at the connectors between cars during stormy weather, or fires resulting from high voltage circuits through the train are eliminated. The current for the motors is collected from the third rail, led through the local car-controlling apparatus to the motors and then back to the surface rails and does not pass from car to car. The controlling apparatus is so located that the motorman may have convenient access to all parts from the platform.

All controllers are automatically turned off by the application of the automatic air brakes, and in case of a train breaking in two the brakes are automatically applied and at the same time the power is shut off.

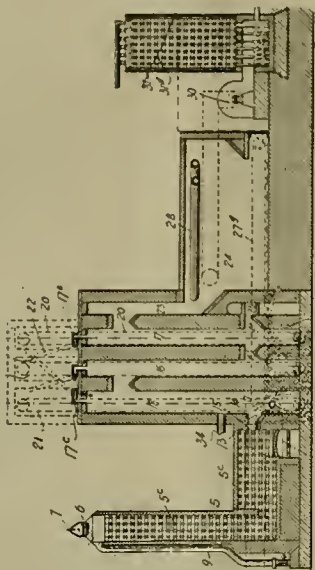
The Brooklyn Elevated will equip all its new cars with four motors each. The 150 cars now in use equipped with the Westinghouse system have each two motors. The trains on the road are made up of five or six cars, two or three of which are usually motor cars. When these trains reach the suburbs they are broken up into smaller units of one or two cars, each containing a motor car, and the smaller trains branch off on different divisions. By this system it is possible to operate cars individually, as on ordinary trolley roads, or to make them up into trains of any length. Also, any proportion of motor cars may be used, making it possible to obtain any desired amount of power for starting the trains quickly, which is necessary in any service involving many stops.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 6, 1903.

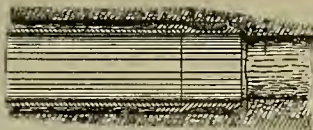
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

OXIDIZING FURNACE.—No. 717,093; J. E. Greenawalt, Denver, Colo.



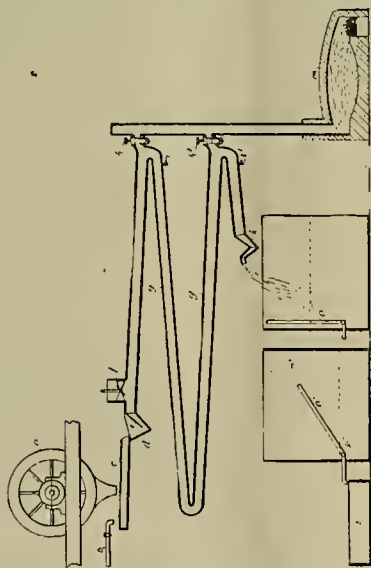
In stack oxidizing furnace, combination of two or more shaft compartments, dust chamber compartment, means to elevate hot and partially roasted ore falling at bottom of one of shaft compartments, to top of another shaft compartment, and means to collect hot and partially roasted dust falling in dust compartment and elevate it to top of one of shaft compartments.

WELL CASING PACKER.—No. 717,160; J. T. Callanan, Butler, Pa.



Packer comprising tubular packer body having exterior formed with downwardly tapering portion, means for securing body to well casing, and flexible packing material secured to body exterior and inclosing downwardly tapering portion and extending longitudinally beyond lower extremity of body.

PROCESS OF EXTRACTING COPPER FROM ITS ORES.—No. 717,565; A. von Gernet, London, England.

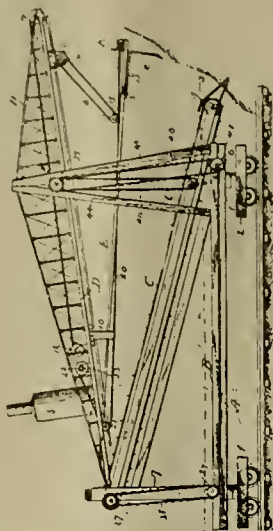


The process of extracting copper from its ore, which consists in slowly passing ore in form of pulp through current of sulphurous acid passed in direction opposite to that of travel of pulp.

WURTZILITE PRODUCT.—No. 716,787; R. M. Thompson, Sutton, Nebr.

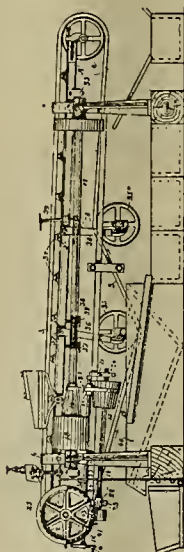
The wurtzilite product combined with hardening substance as mica, asbestos or soapstone, and a quantity of sulphur.

EXCAVATING MACHINE.—No. 717,589; E. A. Mathers, Washington, D. C.



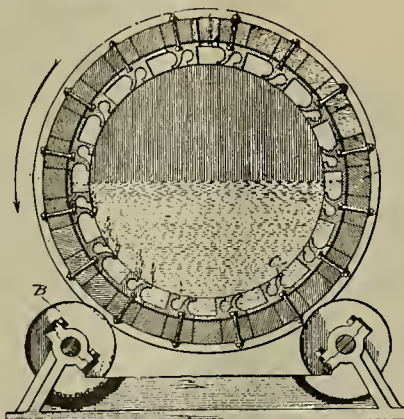
In excavating machine, combination of frame, digger comprising head with digging devices and rearwardly projecting arms mounted on frame, arms being mounted to slide in suitable supports on frame, means for carrying digger upward and forward and lowering into earth, and then drawing back toward machine away from point of loading with load and freeing it from load by raising and again carrying forward, and driving mechanism.

CONCENTRATOR.—No. 717,805; J. S. Brownell, San Francisco, Cal.



In vanner or concentrator, including endless traveling belt and worm-gear, members of which are movable one relative to the other and through which motion transmitted, an eccentric from strap of which worm is suspended, and by turning of which worm and gear may become engaged or disengaged, and a swiveled journal-box suspended from strap and in which shaft of worm is mounted.

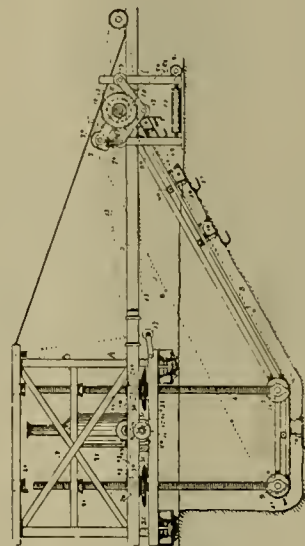
METHOD OF TREATING ORES.—No. 717,864; J. T. Jones, Iron Mountain, Mich.



Process of mixing with ore, to be treated, leaching fluid, which consists in confining mass of ore in vessel with body of leaching fluid of lesser specific gravity superimposed upon it, carrying portions of ore upward in vessel and releasing it above body of leaching fluid to precipitate it through body, and simultaneously convey portions of leaching fluid below

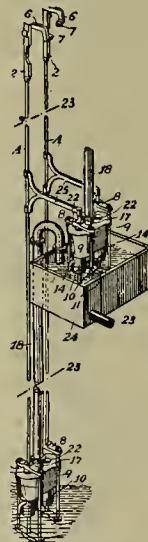
surface of mass of ore and releasing it and permitting it to rise through same.

EXCAVATOR.—No. 717,835; W. H. Fulcher, Oakland, Cal.



An excavating machine, consisting of portable frame work upon which mechanism is carried, means for advancing it in line of proposed excavation, a transverse extension from one side of frame, an endless chain with excavating mechanism carried thereby, guides for excavating mechanism having one end movably supported from outer end of transverse extension, and mechanism by which inner end of guides and chain sprockets may be raised or depressed.

MINING PUMP.—No. 717,852; J. K. Hogan, Placerville, Cal.



A deep-level pumping apparatus comprising parallel open-bottomed cylinders with inlet openings, plungers, valves and discharge pipe; second series of similar pumps located at intermediate levels between bottom and top; tanks from which pumps are supplied and into which water from levels below is successively delivered; pump rods extending to bottom, rods having connection at lower ends with plungers of lowest pump, and having rackbars at upper ends; mechanism including a horizontal shaft and toothed segments engaging rackbars whereby rods are alternately reciprocated so that one pump is always lifting before the other commences to descend; and connection between rods and plungers of each of intermediate pumps whereby all are operated in unison.

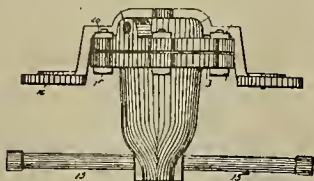
SEPARATOR.—No. 717,971; E. Colvin, Scranton, Pa.



Machine for separating granular material into grades according to size, comprising series of equidistant shafts and series of wheels arranged on each shaft, each wheel consisting of three equidistant radial lifter arms or blades projecting at right angles from shaft, blades of all wheels throughout series being of same length, and corresponding arms or blades of all wheels extending in same direction at all times during revolution, arms or blades of each shaft intermeshing with arms or blades of shafts each side thereof, and number of wheels on shafts being decreased toward discharge end of series of shafts, and

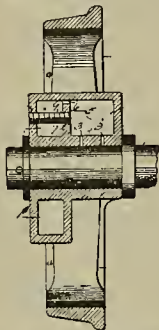
means for imparting motion at same rate of speed to all shafts.

OIL BURNER.—No. 717,937; G. W. Smith, San Jose, Cal.



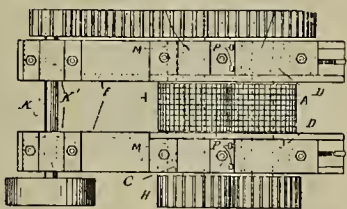
Oil burner comprising retort having annular flange or projection extending laterally from body thereof, conduits for generated gas extending laterally from lower portion of retort and having upwardly directed apertures, spreader supported upon retort and having wings arranged above apertures and at such a height with reference to flange as to deflect flames from apertures against under side of flange to heat retort.

AUTOMATIC OILER FOR MINING CARS.—No. 718,039; R. S. Walker, Pinehill, Pa.



Wheel having oil chamber extending around but not communicating with bore, waste chamber, oil passage between latter and bore, oil passage between oil chamber and waste chamber, coincident openings in one side of oil chamber and in partition between latter and waste chamber, and closure for openings.

BRIQUETTE MAKING MACHINE.—No. 718,043; E. B. A. Zwayer, Hohoken, N. J.



In briquette molding machine, combination of rolls tangent to each other, disks secured together forming rolls, circumferential ridge on each disk, ridges at right angles to circumferential ridges and in circumferential surfaces of disks, cavities on sides of circumferential ridges and between ridges at right angles thereto, and means for driving rolls.

"Weber" Gasoline Locomotives.

Herewith is illustrated the Weber mine and in-

dustrial locomotive. It is supplied with a scrubber for neutralizing the products of combustion for tunnel work, or with cab for surface work. The frame is of steel. All holes are drilled and reamed and turned drift bolts hold the parts solidly. The engines are of the double-opposed cylinder type, and it is designed to handle the load with ease and least vibration. Both hot tube and electric ignition are used. The engine transmits the power to the drivers by steel cut gearing and the different motions—forward, backward and stops—are controlled by steel clutches operated by levers. The axle boxes are provided with vertical space to allow spring cushions to avoid jar. The drive wheels are steel tired (shrunk on) and are pressed on the axle and keyed.

The Weber system of supplying gasoline to the engine is simple. The locomotive is supplied with a powerful brake, and when a quick stop is necessary both the brake and reverse clutch can be applied.

From the engineer's seat all levers and valves for controlling the locomotive are within reach; he is able to cut out either cylinder from work, thus reducing the consumption of gasoline. The engineer is able to look ahead so that he may see obstructions on the track.

The 4-ton locomotive illustrated in the cut is in operation in a 1200-foot tunnel on the property of the Batopilas Mining Co., at Batopilas, Mexico. This tunnel is almost 2 miles long. The question of vitiating the air by the exhaust gases from the engine, was a serious one. This, the managers say, was overcome by washing these gases in the scrubber shown on the right hand side of the engine.

Experiences of a Working Miner.

Written for the MINING AND SCIENTIFIC PRESS.

Not being overworked, I went out to see my old friend W—, the millman at the B— mill, some months ago. As I approached I did not hear the cheerful roar of the stamps; but W— had told me he expected there would be a shut-down, so I mentally concluded it had arrived. All was quiet about the place—not a soul in sight about the big red mill. I walked up the slope toward the building, hoping to find some one about who could tell me where I might find W—.

As I neared the mill I heard, or thought I heard, a strange noise within. As I drew nearer this peculiar sound grew louder, until at the threshold I hesitated. It sounded like a small cyclone had broken loose within the building. I pushed the sliding door aside, and a glance gave the much desired explanation. W— was there with four assistants "cleaning up." I never saw the process before—conducted in the same way. Three of the assistants—the assayer's helper, the hookkeeper from the office and a mill hand—were vigorously engaged in scraping the unoffending silvered copper plates with hoe-shaped chisels, ground sharp as razors. They were working faithfully and getting down through amalgam and silver to the copper all right. In order to facilitate the process, the assayer had a gasoline blast furnace from the assay office under his arm and was "treating" the plate to a good roasting, while W— followed in his wake with a chisel that fairly peeled from the hot plate the thin coating of amalgam and much silver. It was the final clean-up,

W— explained, as things were "shut down for good."

"We have done this twice before," he further remarked; "it is about the only way we can get anything out of the rock at this mine."

Not long since I met my old friend, Silas Jones, a miner and a careful, conservative man. He owns the O— mine, near P—. I may say that in all probability my old friend would not recognize himself in the above name; but he will, no doubt, should he read the following, recall the conversation. As we met I said:

"Well, Silas, how are you and how is the mine?"

"Oh, I'm all right," said Silas, "and the mine is all right, too, though for a long time it was all wrong."

"Yes," I replied; "I know it was not all roses with you. Where's Pete?"

Pete was his old foreman and, in fact, superintendent, millman and everything else.

"Pete? Oh, he's gone down to Mexico. Got a good job, I guess," replied Silas.

"Pete left you and gone to Mexico?" I inquired, in some surprise, for I knew Pete had been with him for years, and Silas thought there was no one like him.

I thought so, too; but my point of view was somewhat different from that of Silas. I had hinted a number of times to Silas that I thought Pete was rather slow and not wide awake enough for these days; but Silas could not see it. He knew Pete to be perfectly honest, and that he gave freely of all that was in him. But Pete was behind the times.

"Whom have you now?" I asked, interested in knowing what had taken place.

"Oh," said Silas, with a queer smile, "I got a young fellow—regular kid. He's a college boy. I didn't go much on 'em, as you know; but, say, this fellow's all right. He put me to a lot of expense at first—always wanting something new. First he wanted me to put in a huzzaw and what he called an edger. I told him: 'Son, this is a quartz mine, not a sawmill.' But he said he needed it, so I let him have the outfit. Well, you ought to see it work! Cuts off a stick quicker than you can get ready to saw it by hand. And that edger—funny, but I never heard of one before this new fellow came—it's worth its weight in gold. Frames a set while you are thinking about it. You know we had a lot of tanks that used to be used when we worked silver ore from the old H— mine. Well, he has turned that into a cyanide outfit, and he just takes gold out of tailings till further orders. Oh, he is all right, I tell you. Always experimenting and never satisfied till he gets the last cent, or near it. There's one thing about it—the mine pays again—something it has not done before since we got below the water line. He thinks he can make some more improvements and I'm going to give him plenty of head room. He makes mistakes sometimes, but he is making a general success, and that is what counts with me. I tell you, son, Uncle Silas has changed his views some, and I don't believe any more in letting my neighbors do all the experimenting."

Improved Aluminum Methods.

A French engineer by the name of Quesnel has discovered new processes for the manufacture of aluminum which seem to impart to the metal all those qualities which it has heretofore lacked. If the samples submitted have been produced by as simple processes and at about the same cost as aluminum is now manufactured, we have no doubt that the manufacture of this metal will before long undergo a complete revolution.

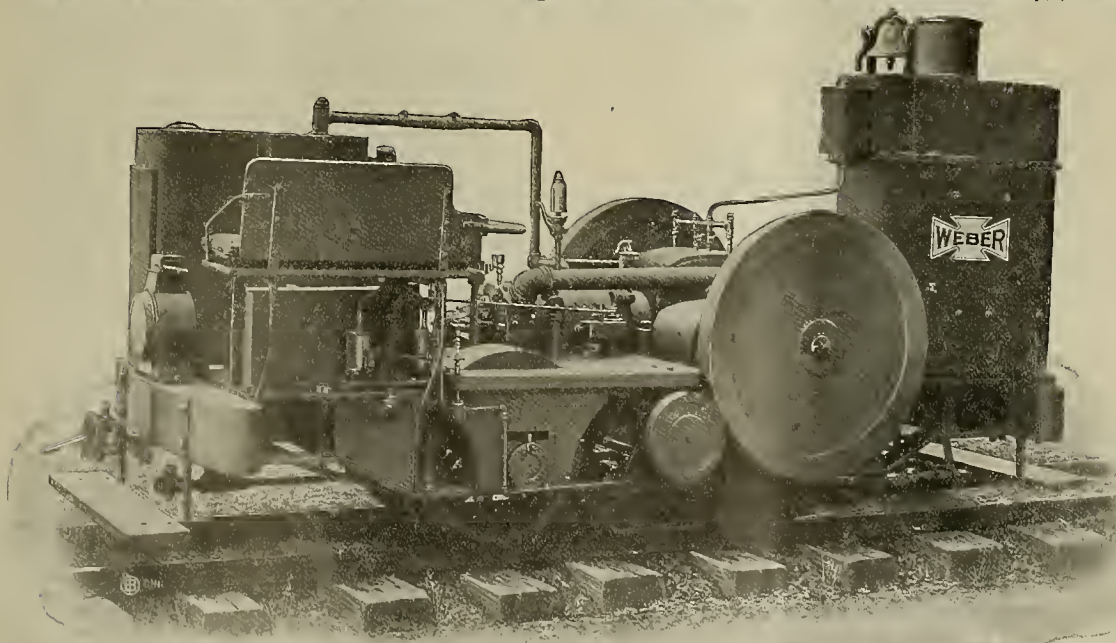
Mr. Quesnel professes to be able, by insignificant proportions of alloyage—varying from 1 to 20 grams per kilo—to make a whole series of metals offering resistances from 20 to 40 kilos per square millimeter.

This new metal can be chased, stretched and rolled out into plates, leaves and wire; it remains soft like aluminum, or assumes the rigidity of steel plate, without ever breaking, like aluminum, which permits of using it in a thickness three times less, while the solidity is greater.

It can be forged, soldered and brazed. Mr. Quesnel submits some astonishing samples of sheets of 2 meters brazed like angle iron or T bar, which seem impossible to disconnect and which are twisted and pulled sideways.

The homogeneousness of the metal is perfect, without flaws or spongy portions, and it is in no way dry or brittle.—Journal de l'Electrolyse, Paris.

Rocks of similar character pass from one group to another by almost insensible gradations by the addition of certain minerals, which by further additions make them prominent, or, by the gradual disappearance of some mineral, causes the rock to assume a different physical aspect and to also change its chemical composition.



"Weber" Gasoline Locomotive.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

A strike of gold-bearing quartz is reported on the divide between Chicken and Lost Chicken creeks in Forty Mile district.

ARIZONA.

The copper product of Arizona for 1902 is reported as follows:

	Pounds
Copper Queen, Bisbee.....	36,000,000
United Verde, Jerome.....	35,000,000
Arizona Copper, Clifton.....	32,000,000
Detroit, Morenci.....	17,000,000
Old Dominion, Globe.....	12,000,000
Calumet and Arizona, Bisbee..	3,000,000
Silver Bell, Pima.....	2,600,000
Shannon, Clifton.....	2,000,000
Val Verde, Big Four.....	2,000,000

Total.....141,600,000

COCHISE COUNTY.

A one-fourth interest in the Caballona mine owned by Short & Mead was sold recently for \$50,000 cash. The mine is 15 miles from Douglas, and is shipping seventy-five tons of ore a week.

Work is resumed at the Calumet & Bisbee D. Co., near Bisbee. The property of this company is near the Lake Superior & Pittsburg holdings. S. Turner is superintendent.

GILA COUNTY.

The Troy-Manhattan Co., near Globe, has resumed smelting.

The Old Dominion at Globe is unwatered, the pump at the 1200-foot level is again in operation, and one of the bailing tanks has been replaced by a cage.

MOHAVE COUNTY.

J. Mulligan, owning the Silver mine in the Basin country, near Kingman, says the crosscut has exposed a body of concentrating ore.—S. C. Bagg is making cyanide tests on the tailings from the Katherine ores, recently run through the Sheephall mill.—D. H. Moffatt of Colorado bought the White Hills M. Co.'s property last week at sheriff's sale.

O. P. Posey, manager of the Gold Roads M. Co., is building a cyanide mill at the mine, near Acme. The mill will have a daily capacity of 500 tons. Three hundred men are employed in the mine and at the mill. It is expected to be in operation March 1.

A 40-stamp mill is being erected at the Mellon mine, in the same neighborhood. This property is owned by Mr. Turner of New York.

At the Leland-Mitchell mines of the Mohave M. Co., near Kingman, four tunnels are being driven on the vein. Machine drills are being put in.—Manager Mensch has men at work on the Union Pass mines and a shaft is being sunk in the tunnel, where a 4-foot vein of milling quartz shows. The crosscut tunnel is in 100 feet.—S. C. Bagg of the New Comstock mines says he is drifting on the hanging wall of the Katherine mine at the 185 level and has opened up ore.

SANTA CRUZ COUNTY.

The Old Glory mine in the Oro Blanco district, under the management of Job & Brand, has resumed, with fifteen of the thirty stamps dropping from one of the open cuts. The ore body is 4 feet wide, averaging \$18 per ton. The Oro Blanco group, bonded by J. Owens, is being opened up by three shafts, all of which show ore. A. Bogan is superintendent. The present depth is 80 feet. A hoist is being put in.

YAVAPAI COUNTY.

At the Alto group in Eugene gulch, near Bigbug, the shaft is down 150 feet, but being started from the gulch bottom it has a total depth of 800 feet below the apex. It is intended to sink 50 feet deeper, when the first level will be run.

Platinum is reported found on the Moonlit Wanderer claim, 8 miles east from Prescott, in the vicinity of the White Horse mines, by C. A. Whipple.

The American Copper Co., operating the Iron King mine, near Jerome, are putting in a mill which will treat 100 tons per day.

Superintendent A. J. Pickorell of the Gold & Copper M. & M. Co. says the cyanide plant at the Chicago mill, near Prescott, is in operation.

The Pfau G. M. & R. Co. are working a group of four claims near Jerome, and have a tunnel in 125 feet, showing 3 feet of free milling gold ore.

The United Verde smelter at Jerome is reported temporarily closed down, due to a shortage in coal.

Superintendent Lacase is driving a tun-

nel on the Red Apache mine, Walker district, and is in 155 feet, with 3 feet of ore carrying values in gold, silver and copper.

YUMA COUNTY.

P. Devine, of Devine Bros., at Sunset, is reported to have made a gold strike 9 miles from their camp. The discovery is on the eastern slope of the Harqua Halas, near the top of the divide. Devine has located a number of claims.

CALIFORNIA.

AMADOR COUNTY.

Superintendent B. C. O'Neill of the Del Monte mine, near Jackson, reports as follows: Total length of crosscut tunnel to January 1, 530 feet; cut in December, 68 feet, at a cost of \$9.33 per foot; cost of running mill for December, \$121.50; cost of construction work, \$98.25; total length of Del Monte tunnel to January 1, 173 feet. The upraise will be connected with the old shaft. Drifts will be run east and west.

At the Bunker Hill mine near Amador City the 1400 and 800 levels are being worked. The building of a mill in the spring is proposed, says Superintendent R. C. Downs. It is reported the erection of a 60-stamp mill at the Fremont-Gover near Amador City will begin early in the spring. E. C. Furrington is superintendent.

BUTTE COUNTY.

The Feather River Power Co., incorporated in San Francisco, will install an electric power plant 20 miles above Oroville. Power will be distributed to mines and metallurgical works in that portion of the State and to other industrial enterprises at a distance.

CALAVERAS COUNTY.

(Special Correspondence).—M. A. Shepard has bonded the Shepard mine, 5 miles north of Mountain Ranch, to the Gray Wing Co. The representative will put on a new steam hoist and a 6-stamp mill. Operations will be resumed upon completion of hoist.

Angels, Jan. 13.

(Special Correspondence).—The Sultana M. Co. at Angels is erecting a new gallo-frame and a 20-stamp mill. Work is being pushed and the stamps will begin to drop in February. Twelve Frue vanners will be put in. The construction is in charge of C. Lee. A. Chalmers is superintendent. The Sultana M. Co. are now operating the old Bovee mine.

The Oriole M. Co., near Angels, is changing its compressor from steam to electric power. A 100 H. P. motor is to be put in for the purpose. Work upon the 10-stamp mill is being pushed and will be completed Feb. 1; it will also be run by electricity. A 50 H. P. motor is being put in. While the changing of power from steam to electricity is going on, two ten-hour shifts are developing on the 600 level. There is a large amount of ore blocked out, warranting the erection of the mill. E. D. Griffiths, superintendent, states that they expect to add ten more stamps in the summer.

Angels, Cal., Jan. 14.

In Bear Creek district, near Jenny Lind, the Big Six mine has a shaft down 50 feet and a winze on the ledge 50 feet farther. This winze is run on the hanging wall, and from the bottom a crosscut has been run 12 feet toward the foot wall in ore. The rock carries free gold and sulphurets.

The Carson Hill G. M. Co. has incorporated under Arizona laws. The property of the company consists of the Boston and A. P. A. mines on Carson hill, near Melones, and adjoining the South Carolina on the west.

Work is resumed on the Black Cat mine near Mokelumne Hill. Men are repairing the road leading to the mine.

Work on the Sultana mill near Angels will be completed this month. The tramway from the Bovee shaft to the mill is being torn down and a track laid on the surface.

INYO COUNTY.

The Leidy M. Co. mill, near Bishop, is in operation.

The Cecil R. M. Co. has installed a second battery of five stamps on its property at Ballarat. They propose to put up a cyanide plant.

KERN COUNTY.

The county supervisors have granted a right of way along the county road for a pipe line from the Kern river oil fields to Bakersfield, to be built by W. H. Hart of San Francisco. The line will be double. It is said the intention is to convey oil at a price not exceeding 5 cents a barrel.

The Kern River Oil Co., at McKittrick, will increase the production of their wells to 1500 barrels daily. There are eleven finished wells on the lease.

It is reported that Jewett & Blodgett will build a pipe line from Sunset north-

west to the California Fortune and Lucky Boy wells. Tankage for 175,000 barrels is to be provided at Sunset.

MONO COUNTY.

At the Sweetwater Con. mines in Silverado canyon, near Bridgeport, connection has been made on the lower level with the air shaft.

The Gorilla mine of Lundy has been relocated by S. Lavoroni.

The mining suit of Haggin & Hearst vs. Kelley et al., involving the ownership of the southeast of a group of mines at Bodie, which was tried in the Superior Court at Bridgeport last week, resulted in a verdict for plaintiff. This was the second trial, and the verdict is a reversal of the former decision.

NEVADA COUNTY.

Superintendent Bray is putting in an air compressor at the Posey mine.

At the Union Blue Gravel mine, near North Bloomfield, the 10-stamp mill is in operation. The main tunnel is in 5100 feet.

The Conlin mine, near Grass Valley, has been unwatered and underground operations resumed.

The Crystal Lake G. M. Co.'s 10-stamp mill at Meadow Lake is running on ore that mills \$9 free gold. The vein is 25 feet wide. They propose to put in thirty more stamps this spring.—Freeman & Vineyard of Cisco have bonded their group of Meadow Lake mines to San Francisco parties, who will erect a 10-stamp mill in the spring.

ORANGE COUNTY.

Orange county's oil production from the Fullerton and Brea Canyon districts for December aggregated 120,000 barrels, the largest in the history of the field, and 50% greater than for the same month in 1901. One-third of this was produced by the Santa Fe Railroad Co., which pumps thirty wells. The Brea Canyon Oil Co. is next with 20,000 barrels, while the remainder is divided between a number of smaller companies producing from 2000 to 12,000 barrels apiece. Considerable oil is shipped by the Union Pipe Line to San Pedro, and from there to San Francisco for refining.

PLACER COUNTY.

At the Kings Hill mine, near Iowa Hill, Noble & Carpenter are ground sluicing.—The Dewey hydraulic, at Iowa Hill, is in operation under permit of the Debris Commission.—The Hidden Treasure Co. at Centerville has struck a gravel channel 8500 feet in on the main tunnel. The new channel is 100 feet wide and 21 feet lower than the Hidden Treasure-Mountain Gate channel. An incline has been run and the channel opened 300 feet east and west.—Hosmer & Welker are cleaning up at the Lehigh canyon claim, below the Paragon, at Bath.—The water has been lowered in the Morning Star reservoir, near Damascus, and men are removing 800 dead trees.

The Pine Hill mine, 14 miles from Auburn, has a new 10-stamp mill, two rock breakers, four concentrators and an air compressor. The plant is operated by steam power. The buildings consist of a boarding-house, superintendent's residence, assay office, hoist and mill buildings. Twenty-five men are employed at the mine. The main shaft is 180 feet deep with a 400-foot crosscut and three levels. The vein is 15 feet wide.

PLUMAS COUNTY.

H. B. Budd, J. M. Engle et al. have bought the Borentz, Fallet and Odneal gravel mines at the mouth of Mill creek, above Rich Bar, for \$12,800.

SAN BERNARDINO COUNTY.

The Great Western Oil Co. has filed notices of location covering 16,000 acres near Victor, on the desert north of San Bernardino.

G. H. Hamstadt is working five men on claims near the Copper World.

A body of opal-bearing rock is reported found in the mountains 40 miles north of Barstow.

SAN DIEGO COUNTY.

In a tunnel being run on the Berdugo claim, near Banner, it is reported rich ore has been found.

S. H. Lucas, of Los Angeles, reports that a Boston company has bought the Stonewall gold mine on the Cuyamaca grant, for \$200,000. The mine, which has been idle since 1894, was formerly well equipped with hoist and mill, and has been worked to a depth of 500 feet. It has produced several hundred thousand dollars in the past. S. H. Lucas will be superintendent.

SANTA BARBARA COUNTY.

The Brookshire Co. will be drilling next week.—The Plinal Co. has a second well started.

SHASTA COUNTY.

E. H. Sherk, on his claim at Harrison

Guleb, in digging a cut for the face of a tunnel, is reported to have found gravel from which he panned out coarse gold ranging in value from \$3 to \$12.

A strike of copper ore is reported in the Blue Jay mine, owned by Sutton & Leaming, in the Old Diggings district, 4 miles north of Redding. Samples of the ore show native copper and pyrites. The ledge of copper ore is 2½ feet wide at the surface. The mine is within 2½ miles of the Keswick smelter.

The Great Divide G. Co., composed of St. Louis, Mo., and Redding men, has bought two groups of gold and copper claims in the Mule Town Mountain mining district, 4 miles west of Redding. The mine joins the Mount Shasta mine on the south.

The Crown Deep M. Co. will put up a cyanide plant on its claims, 4 miles west of Redding, at a cost of \$75,000, says the Free Press. The group comprises five claims. The plant will be on the Gold Bronze claim.

The final payment has been made on the \$650,000 bond on the Balaklava copper claims, 6 miles north of Keswick, by the Western Exploration Co. W. F. Snyder is manager.

SHASTA COUNTY.

At the Connor group of mines on Salt creek, 4 miles west of Redding, the vein has been out at 80 feet in the shaft.

SIERRA COUNTY.

A. C. Busch says he will reopen his Phoenix mine, near Sierra City, this spring.

R. Phelan says he has bought the interests of some of his partners in the Sacred Mound mine, near Downville, and he intends to drive the Sacred Mound tunnel to intercept the ledge of the Butte Saddle mine, which would give 2500 feet of ore backs.

SISKIYOU COUNTY.

A crosscut tunnel, now in over 1300 feet, is being driven with machine drills at the Cherry Hill mine, near Yreka, to cut the vein developed in the upper workings. H. W. Turner is superintendent and E. H. Nutter foreman of the mine.

The Etna Advance says a strike has been made in the Advance mine at Salmon river, on Russian creek. The ledge is 4 feet thick at a depth of 75 feet.

The Yreka M. & M. Co., owning the Ball group in Klamath basin, Liberty district, have their aerial tramway in operation. Superintendent L. D. Ball has let several contracts for development work and is opening up ore bodies in the Klamath ledge. It is the intention to install an electric plant on the Salmon river.

TUOLUMNE COUNTY.

The Rawhide M. Co. has attached the property of the Tuolumne County Water & Power Co.

J. N. Jones has sold to A. Clark, S. Y. Strait and E. F. Cadle of Stockton a three-fourths interest in the Izurnia Irene mine, adjoining the Maddox ranch, 1½ mile from Confidence.

W. J. Graham has sold to the Vetalis M. & M. Co. a portion of the May Flower group of mines, near Carters, also the right of way through the tunnel for twenty years.

W. H. McClintock has deeded to the Don Pedro G. M. Co. the Don Pedro and Stokes quartz mines and the Stokes mill-site, near Don Pedro.

At the Dutch mine at Quartz the main shaft has passed the 1500-foot mark and they are sinking.

At the Harvard mine, near Jamestown, thirty of the sixty stamps are dropping on ore from Nos. 1 and 2 shafts, both down 700 feet, electric and steam power being used.

Superintendent E. Partz of the Goldwin mine, near Carters, says operations will be resumed.—At the Spring Gulch Superintendent Parrish has the 6-stamp mill in operation.—The mill at the Sunnyside has resumed, says Superintendent Smith.—At the Top Notch, near Carters, work has been temporarily stopped on account of water. Manager W. R. Cunningham says a steam hoist and pump will be placed.—A stream running 10 inches of water was tapped in the Lady Washington tunnel, near Carters, last week.—The ledge at the Esmeralda has been struck.—The Lost Fox mill has closed temporarily while the shaft is being sunk.

A road is to be built near Carters to the Jersey Blue mine in the canyon near the Goldwin by Superintendent Tyack.—An oil burning plant has been installed at the Black Oak, near Soulsbyville.—The Rio Vista M. Co. has filed with the county clerk notice of its change of place of business from Columbia to Sonora.—Work will be resumed on the Black Oak south extension, known as the Sullivan.—A cleanup at the Prudhomme mill on January 1 is said to have given \$900 for a nine days' run.

It is reported work will be resumed in

the Santa Ysabel mines at Stent. E. C. Loftus is superintendent.

At the Big Casino, near Big Oak Flat, they have laid a pipe from the mill to the creek, where they are putting in a dam. A gasoline engine and pump are in operation. Underground they are working the 400 level east of the Mack shaft. As soon as the compressor is ready, sinking will resume in the Wooten shaft and a drift run west to connect with the older works. It is proposed to add ten stamps to the mill.

At the Two Brothers, operated by the Big Casino Co., near Big Oak Flat, sinking is resumed.

Operations are resumed at the Hull mine, near Groveland, with W. Vincent superintendent.

The Laura, North Star, Carlotta, Pennsylvania, Brown, Venus, Columbus and Columbus Extension mines, near Carters, are reported sold to Eastern men. Three of these mines have hoists, mills, etc. T. M. Wells is general manager and C. L. Lang superintendent.

COLORADO.

BOULDER COUNTY.

The mill of the Gold Extraction Co. at Wall Street has resumed. The mill is equipped to treat ore by an electrolytic process. There are 1000 tons from the Nancy tunnel and several thousand tons from other mines on hand to be treated by the new process.

The South American mine, near Wall Street, is being worked by leasers. Manager Tiffany says the Tambourine will resume. Machine drills are at work in the Nancy tunnel. The George Henry claim, worked through the Black Cloud tunnel, is showing an 18-inch streak that runs \$36.

A contract has been let to drive a tunnel 3300 feet to cut the Melvina vein by Manager J. R. Wolff of the Melvina mine at Wall Street. It will be 5x7½ and starts on the Little Melvina. Machinery is to be installed.

The Savannah Coal, Oil & Gas Co. last week made its last payment of \$9075 on the G. R. Poor farm, northeast of Boulder. There are thirty three acres in this tract, which is south of the Otero property.

The Corona M. Co., through Manager B. A. Langridge, has made a second payment on the purchase price of \$100,000 for the Black Cloud group, Gold Hill district.

In the Boulder-Valmont well, at Boulder, the drill has cut through 45 feet of oil sand of a white pebbly nature and oil has risen 800 feet in the hole. The Boulder-Valmont is 200 yards north of the Savannah and surrounded by the three Otero wells. At 1960 feet the drill was still in sand.

The Mountain Chief property, near Rowena, has been taken under lease and bond by E. Martin.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Whittier group of mines at Fall River has been sold to the Lucania M. T. & T. Co. of Colorado Springs for \$2000. The Lucania Co. intend driving a tunnel through to Russell gulch. The tunnel is now in 400 feet. The tunnel on the Whittier claim is in 200 feet; ore averages \$10. They will install an air compressor.

Fall River, Jan. 12.

The Idaho Springs Gazette gives the following figures, showing the increase of output for this county:

Year.	Cars.	Tons.
1899.....	924.....	18,480
1900.....	1,012.....	20,230
1901.....	1,410.....	28,200
1902.....	1,677.....	33,540

Driving by hand in the Lucania tunnel, near Idaho Springs, is stopped and the foundations for a power plant are being put in.

A strike is reported at the Little Matie, near Empire, in ground worked by leasers.

Leases on the Silver Mountain group have been granted to Trevillion & Co., Wellbaum, Needham, and others. The workings consist of a shaft 350 feet deep and four levels that connect with the Pittsburg lode.

Lessee Rich of Denver, working the Mendota dumps, near Georgetown, is shipping the zinc ore to the Empire Zinc Co.

Manager Teagarden, the Red Oak Co., near Georgetown, has resumed on the crosscut from the Scepter adit to tap the Astor vein and expects to drive 75 feet. The Scepter adit will be driven ahead, and a raise of 396 feet made to connect with lower adit on the Sunhurst. The tramway will be repaired. Electric wires are being run to the Scepter adit to operate a fan, and electric drills will be used.

The Beresford M. & M. Co. has bought a group of claims opposite the Lamartine mine in Freeland district, consisting of forty acres, and a 3000-foot tunnel site. R. Willis of Colorado Springs is manager.

The shipments of ore of all grades from the mines of Empire for 1902 amounted to 3000 tons. The average value is estimated at \$20 per ton. This is net to the miner who shipped the ore; 85% of this was gold. Silver, lead and copper made up the balance.

FREMONT COUNTY.

(Special Correspondence).—"Positively No Admittance; Apply at Office!" "Keep Out. This Means You!" and other stereotyped signs with which one is usually confronted are done away with at the works of the United States Smelting & Refining Co., Canon City. They have no secret process to conceal. The chief product is pigma, or paint base. They are handling about 100 tons of ore per day. They are more than doubling the capacity of the plant. All of the improvements are going on while the plant is in operation. They are erecting a new sampling mill. One hundred men are employed. D. C. Jackling is manager.

The Dorcas mill, at Florence, is handling 125 tons of ore daily from the Cripple Creek district. Begeer's cyanide process is in use in the mill. The capacity of the mill is being added to.

The Frszer Oil & Gas Co., Florence, has a lease on sixty acres of ground in the oil belt; they commenced operations Oct. 1, 1902, and started to pumping on Dec. 9. They have a good flow of oil. No. 1 is down 2000 feet and they are starting to drill No. 2. Derricks are of the standard type, 72 feet in height. G. Columbia is manager.

Florence, Jan. 13.

The Fremont M. & D. Co. has been incorporated in Florence to operate in Fremont, Teller and Hinsdale counties.

G. Heberling and M. Crowner have a contract for drilling for oil in the South Park field. The United Oil Co. and other companies are arranging to put down wells there, says Superintendent Robinson.

A 100-ton addition will be built to the Empire smelter, near Canon City. Zinc and lead ores only are treated. A 50 H. P. motor is on the ground to be used for reserve purposes.

GILPIN COUNTY.

A number of leasers are at work on properties of the Hillsdale G. M. Co., in Gregory district, and regular shipments are made to the mill.

The Forfar mine on Pewabic mountain, near Central City, has resumed under lease and bond by E. S. Moulton. The shaft, which is 300 feet deep, is being unwatered.

The Druid G. M. Co. are working the Hazeltine property in Willis gulch. They are drifting and crosscutting on the 100-foot level of the shaft, west of the main shaft, before resuming sinking. They have put up a hoist on a south shaft. C. W. Anderson is superintendent.

Russell gulch parties are operating the Frontenac at the head of South Willis gulch, under a lease from Kruse, Campbell & Co., and making regular shipments to the smelter.

Sinking is resumed at the Powers shaft in Russell district, a dam having been completed to catch the water at the 200 level, and will be sunk to the 325-foot point. The 200-foot levels are showing up ore with a shoot 18 inches wide of enargite. The last shipments made from this level gave net values of \$75 per ton, with 23% copper.

F. Frickey has a contract for sinking 25 feet on the Old Ann mine, at the head of Silver creek, which will make it 425 feet deep, after which drifting and crosscutting will begin.—Central City parties, working the Baby Ruth mine, in Eureka district, made shipments last week to the stamp mills.

Sinking is resumed at the Bon Ton mine in Eureka district, operated by the Cleveland M. Co., and will go down to 250 feet.

At the Spur Daisy two shifts are re-timbering the shaft and are down 200 feet. When finished, sinking will resume from the 260-foot level. The ore is high grade.

Central City parties are operating the Ingeborg mine, on Winnebago hill, and have their shaft down 300 feet. Drifts have been started. An upraise is being made from the west 170 level. Shipments of ore from the 300 level are being made.

Shipments were made last week from the Hampton mine, in lower Russell gulch, to the Golden smelter.—Central City men are working on the 600 level of the Cour d'Alene, on Academy hill, under a lease and bond.

New England owners of the Nehema and Cotton properties on Bobtail hill, near Central City, will enlarge their hoisting plant. Sinking is being carried on in the Nehema extension.

The Fairfield shaft, near Russell gulch, is down 500 feet and a level started at that point. W. M. Nickerson of Denver is manager.

GUNNISON COUNTY.

The Pitkin Gold Belt M. Co. has opened

ore in the 235-foot level of the Whig shaft which averages \$40 per ton.

At the coal mines at Somerset, in the western part of the county, the Denver & Rio Grande Co. are erecting coal sheds and bunkers.

A 6-foot body of \$50 ore has been opened in the shaft of the Citizen mine at Pitkin. The company is placing machinery over the shaft, which is down 100 feet. The Maid of Athens, adjoining, has a similar body of ore and is shipping.

The Farley group in the Gold Brick district has been sold for \$5000 on a bond given last fall. Ore shipments from the Granite Mountain mine in Jones gulch are giving values of \$75 per ton in gold.

JEFFERSON COUNTY.

Last week the top works of the Cross coal mine, 1 mile south of Golden, were destroyed by fire. W. Prout, superintendent, says the loss is \$4000, with no insurance.

LAKE COUNTY.

The following are the tonnage figures for Leadville district for 1902: Carbonate ores, 22,930 tons; oxidized iron, 285,494 tons; sulphide, 281,558 tons; zinc, 85,699 tons; siliceous, 72,215 tons; manganese oxide, 1050; total, 748,746.

The men employed in Leadville district: Miners.....2,278
Smelter men.....1,000
Teaming.....187
Miscellaneous.....1,021

Total.....4,486

J. P. LaBelle of the LaBelle M. Co., Leadville, has arranged for the resumption of work on the Black Prince on Breece hill.

The Valentine workings are unwatered below the 500-foot level and work has begun at that station and a pump placed which will handle 1000 gallons of water per minute. No further trouble from water is anticipated. The Valentine will be shipping in a short time.

It is reported that Nicholson & Rodman have leased the Coronado mine at Leadville and they will work it in connection with the Midas. The Coronado has bodies of iron that can be sold to the smelters and it has a shaft deeper than the Midas. They will drive under the Midas shaft and connect. The Oolyte M. Co. has completed the shaft house and sinking is begun.

Work has begun on remodeling and rebuilding of the pyritic smelter at Leadville by the Republic S. & R. Co., recently incorporated. T. Goodwin, general manager, says that the three furnaces would be enlarged and \$75,000 expended in improvements. The plant will handle 500 tons of ore a day. The matte will be sent to the smelter at Salida for treatment. The company owns the New Monarch group at Leadville and will handle several hundred tons a day of its own ore.

W. E. Musgrove says he will this spring work the body of tripoli on his ranch, near Leadville. The deposit is 1 to 4 feet thick and 200 feet in length.

The lessees on the Castle View property on Carbonate hill, Leadville, after taking out a quantity of low-grade iron ore have opened up a body of high-grade lead ore, from which shipments are being made. Lessees of the Sunday mine on Breece hill are developing from the 375-foot shaft.

MESA COUNTY.

A pyritic smelter of 400 tons daily capacity is being built at Grand Junction, and is expected to be ready for operation March 1.

MINERAL COUNTY.

The Candle says the tonnage output of Creede district is given in the following table, at least one-third of this output being concentrates, a product of five to one:

Months.	Cars.	Tons.
January.....	291.....	4,803
February.....	256.....	4,563
March.....	281.....	4,710
April.....	275.....	4,778
May.....	267.....	4,593
June.....	384.....	6,475
July.....	361.....	6,596
August.....	377.....	7,003
September.....	347.....	7,079
October.....	366.....	7,719
November.....	337.....	7,362
December.....	182.....	5,512
Total.....	3,724.....	71,193

PITKIN COUNTY.

It is reported the Della S. mill near Aspen will resume in a short time, having been leased to crush Bushwhacker ore.

The Belzora-Bassick has resumed operations in their 800-foot tunnel, near Pitkin. This company owns the D. C. group adjoining the Bassick. They expect to do considerable work during the season. They also intend to resume at the Little Charley, on which they hold a lease.

SAGUACHE COUNTY.

The Maple Leaf, near Cochetopa, is being operated by Gunnison parties and is shipping ore that will average \$60.

SAN JUAN COUNTY.

Men employed by mines of San Juan county in 1902: Silver Lake, mine and mill, 285; Gold King, mine and mill, 265; Sunnyside, mine and mill, 100; Silver Lodge, mine and mill, 85; Mogul mine, 50; Highland Mary, 50; Esmeralda, 50; North Star, Sultan Mt., 25; Eureka Exploration Co., 20; Natalie, 22; Henrietta, 20; Green Mountain Co., 15; Big Colorado Co., 15; Hercules Consolidated Co., 10; Notaway-Champion, 10; Royal M. Co., 40. Little Bessie, 12; other properties, including prospects, 250; total, 1324.

The shipments for 1902 amounted to 48,160 tons, of which four-fifths were concentrates, distributed as follows:

Gold King (concentrates), 14,428 tons.....	\$750,250
Silver Lake (concentrates), 13,350 tons.....	600,000
Sunnyside (concentrates), 4,742 tons.....	199,164
All other mines and mills, viz: Esmeralda, Red Mountain district, Eureka district, Contention, Brooklyn, Notaway, North Star, Royal, Emma, Nelgold, Cement Creek district, etc., 15,640 tons (principally crude).....	828,920
Amalgam and bullion from mills	564,836
Smelter matte freighted and gold ore expressed.....	105,000
Total.....	\$3,048,170

SAN MIGUEL COUNTY.

Eighty stamps of the Pandora mill of the Smuggler-Union Co. are dropping, crushing 200 to 235 tons of ore daily. The Contention will furnish one-third and the balance comes from the Bullion tunnel level of the Smuggler. One hundred miners are employed at the Smuggler.

SUMMIT COUNTY.

At the Jemima mine on Glacier mountain, near Montezuma, they have driven 75 feet on the cross vein, which widened from 2 inches to 12 feet, with irregular bunches assaying 100 ounces in silver and 36% lead. It is expected to cut the Teller lode. A new company began operations on the Little Jumbo property last week. They have a vein 8 feet wide assaying \$5 in gold, forty-five ounces in silver and 30% lead. Work is being done on the Tip Top, south of the Little Jumbo. This property shows values in lead, gold and silver. The Silver King tramway is in operation. Drifts both ways from the shaft on the lower level of the Pennsylvania mine are being driven and stoping is begun on this level. The 2000-foot contracts on the Rothschild tunnel are completed and the company is calling for bids for 2000 feet more.

The Jessie mine and mill in Gold Run is reported sold to an English company last week.

TELLER COUNTY.

The December production from the Raaler mine of the C. K. & N. Co., Cripple Creek district, amounted to 690 tons of ore that averaged \$50 per ton. A station is being cut at 375 feet, after which sinking will be resumed. The production last month came from the 300 level.—The lessees operating the Cardinal claim of the Little Valeria are driving a tunnel in the north end of the property which will connect with the shaft at a depth of 200 feet, which will permit taking the ore out in the gulch instead of hoisting it to surface on the top of the hill.—The War Eagle Leasing Co., operating the War Eagle on Bull hill, have increased their shipments to 250 tons per week.

The lease on the Fluorine and Fort Wilcox property on Copper mountain, Cripple Creek district, has been bought by the Sioux Falls & Cripple Creek G. M. & D. Co. It is the intention to erect a cyanide plant of 100 tons daily capacity, and work on the excavations for the foundations has begun. The contract for the mill has been let, which will be erected on the J. F. H. claim of the Amethyst Co. Underground work is in progress at three different points, the principal one being in the Fort Wilcox tunnel, which is intended to cut the Fluorine at a depth of 320 feet.

On the lease granted on the south end of the Granite on Battle mountain, near Cripple Creek, to Cartwright & Co., ore is being broken in the 60-foot and the 150-foot levels; a steam hoisting and compressor plant is in operation. The lease takes in that portion of the property around the Midland Terminal tracks. The shaft is 160 feet deep.

The Stratton Independence Co., Limited, on the 12th inst. filed in the United States Court a suit for \$6,000,000 against the executors and trustees of the Stratton

estate and also against I. H. Stratton, heir at law. The complaint alleges that, at the time the mine was sampled, preparatory to concluding the sale, which had been negotiated through the Venture Corporation of London, the samples were "salted" so that the amount of ore estimated on those samples was valued at \$7,000,000, when, in reality, the ore in sight was worth only \$2,000,000 or less. It is alleged that the sacks of samples were opened and sprinkled with ground-up sylvanite.

The Venture Corporation will file a similar suit, claiming that its expert, T. A. Rlokard, was deceived by the salted ore, and the individual stockholders will bring actions for the return of their money, alleging that they were induced to purchase stock at \$5, \$10 and \$15, which was not worth such prices.

Superintendent C. B. Burch has resumed work on the Little John group in Pony gulch, Cripple Creek district. The shaft, down 100 feet, will be sunk an additional 500 feet, and from that point a crosscut driven both ways. Lessees on the Central claim on Gold hill have started a tunnel from the gulch on the north side to cut the main workings at depth. Lessees Gilbert & Co., working on the south end of the Sheriff claim on Raven hill, got returns from their initial shipment of ten tons sent last week of \$25 to the ton.

The December production from the Raalor mine, of the C. K. & N. Co., Cripple Creek district, amounted to 600 tons of ore averaging \$50, which came from the 300-foot level. The shaft is down 375 feet, and a station is being cut at that point.

Lessees Sharp and others, working on the Uncle Sam claim of the Blanche Co. on Bull hill, Cripple Creek, made a shipment of \$25 ore from the 300-foot level last week.

The directors of the Ben Hur G. M. Co., Cripple Creek district, have decided to grant several one-year leases on its property. The Little King and Queen claim will be leased in blocks down to the level of the Good Will tunnel, crossing the property at a depth of 410 feet. C. Tillery has a hock on the north end of the claim and B. F. Tipton will get the Hanson shaft.

Lessees Smith & Altman, operating on the Elizabeth Cooper claim of the Doctor Jack Pot Co., have made a shipment of thirty-three tons, which gave the company royalties amounting to \$905.85. One lot of 17.94 tons was settled for at 4.30 ounces gold per ton; 1470 pounds at 20.73 ounces gold and 5.01 ounces silver; a third lot of 15.959 tons at 7.10 ounces gold and 3.52 ounces silver.

The McFarland & Owenby Co., operating on the Pharmacist Acacia, Isabella and other properties at Cripple Creek, has reorganized as the Owenby Leasing Co., with F. D. French as general manager and W. Campbell as superintendent. The Rocky Mountain Co., operating the south end of the Delmonico, sent out a car of \$50 ore last week, and are sinking the main shaft to 350 feet. From this point levels will be run to the ore shoot. The Practical Leasing Co., operating the Trachyte, sent out 800 tons of ore during December, which returned an average of \$40 to the ton. Sinking on the Findley has ceased, as the shaft is down 1475 feet, and levels are being driven both ways on the vein. A level is started at the 100-foot point to explore the Mountain Beauty ground.

G. Johnson and associates, operating a block on the Pharmacist, Cripple Creek district, sent out a thirty-ton shipment of ore last week assaying \$40. The McDade lease on the same property sent out two carloads. Decker, Patten & Co., leasing on the Gold Sovereign, began shipping last week. Work is resumed on the Amanda property at Windy Point. At the Golden Cycle the shaft is being sunk to 1100 feet. The Last Dollar shipped twenty-five carloads of ore last week.

A new pump with capacity of 1000 gallons a minute to a height of 1000 feet, is being set up in the 1400-foot level of Stratton's Independence on Battle mountain. Manager T. Cornish has had the drifts and crosscuts in the lower levels bulkheaded. The mine produces 250 tons a day. The ore is sorted and shows an increase in average value.

Owenby & Co., operating the lease on the north end of the Burns claims of the Acacia, Cripple Creek district, have granted a sub-lease to Toole & Needham on the workings formerly operated by Fitch & Co.—Gray & Kurtz, leasing on the Monument, shipped a total of 165 carloads of ore last year. Each car contained thirty tons, assaying \$38 gold. The lessees have put in another compressor and are adding more machine drills.—At the Carbonate Queen claim of the Ophir Co., on the northwest slope of Battle mountain, above the Sunset-Eclipse mine, they have erected ore bins and will begin shipments. On the other side of the

mountain they are sinking the shaft, now down 725 feet. It is the intention to continue sinking to 1000 feet.

From the Mary McKinney mine, Cripple Creek district, during December were shipped by the company ninety cars of ore, of which seventy cars went to the smelters and twenty to the mills, a total of 2250 tons, valued at \$75,000. Lessees shipped 250 tons. When the drainage tunnel is completed the company will run a level at the 600-foot point.—The west end of the Mohican property, on Squaw mountain, is under lease to D. McFee, who has a shaft down 30 feet and is drifting on the vein.—Manager W. F. Littell of the Big Twenty Co. will put in a 180 H. P. boiler and a three-drill compressor.

The treasurer's report of the Findley G. M. Co., Cripple Creek district, says during 1902 the shaft was sunk to a depth of 1400 feet and levels run to and on the vein of 900 feet, 1000 feet and 1200 feet. Crosscuts to the vein at 1500 and 1400 feet will be driven as soon as the water conditions permit. There are no leases on the property.

C. Tillery, leasing on the Ben Hur, says in sinking on the King claim at a depth of 45 feet he cut a vein of 18 inches pay quartz.

IDAHO.

IDAHO COUNTY.

The Jumbo M. Co. at Buffalo Hump has struck the ledge in the lower tunnel and has drifted 190 feet on it. The ore is 10 feet wide and averages \$10. The tunnel has 400 feet yet to run to reach a point under the shoot in the upper tunnel.—The Crackerjack, with five stamps, is mining and milling 8 feet of ore. The owners will start to drive their lower tunnel next week.

KOOTENAI COUNTY.

Manager J. W. Ferguson of the Mexleo, near Sandpoint on Lake Pend d'Oreille, says he has the tunnel in 450 feet, reaching 200 feet on the lead. The vein is 4 feet wide, with a paystreak of 6 inches. They are on the Black Tall mountain, 1000 feet from the lake, and can land ore at the smelter to be built at Sandpoint for \$1 per ton.

The Panhandle S. & R. Co. has bought 400 acres of land at Sand Point as a site for the smelter that the company intends to construct. They propose a 300-ton smelter and have bought a line of three steamboats on Lake Pen d'Oreille and the Venezuela group of mining claims.

LATAH COUNTY.

F. C. Smith, working the White Cross mine on Moscow mountain, 9 miles northeast of Moscow, reports a run of twenty tons through the mill, giving a return of \$25 in gold per ton. The ore came from the 225-foot level in an inclined shaft, where ledge is 3½ feet wide. Work in the shaft has been retarded by water and pumps will be put in.

OWYHEE COUNTY.

The Alta Vista M. Co., near Silver City, will install an electric drill.—The Adde mill is making a test run on fifty tons of ore from the Whiskey property.—Operations are resumed at the Sinker tunnel.

SHOSHONE COUNTY.

Eight inches of galena are reported struck in the tunnel of the Humming Bird, near Burke, at 1140 feet from the mouth.

It is said that from 350 to 500 more men are at work in the Cœur d'Alene mines now than at this time last year. It is estimated that 3000 men are working. At Wardner mines, 1000; up Canyon creek—Tiger-Poorman, 60; Mammoth, 140; Hecla, 100; Standard, 245; and Frisco, 250; at Mullan—Morning, 250; and Hunter, 50; at California, up Nine Mile, 45; at sampler below Wallace, 35; at mines at Murray and prospects, 400; at Hercules, 50. Minimum wages in the Cœur d'Alenes are \$3.50 underground, except at Wardner, where it is \$3.50 and \$3; day shift is ten hours and night shift nine.

The North American G. M. Co. is incorporated; C. S. Cryslar, B. M. Cryslar, J. M. Savage, G. H. Stephenson, J. F. Griffin, to operate placer mines near Delta.

The Standard M. Co. near Wallace are putting in electric pumps on the 1000-foot level at a cost of \$30,000. They have a capacity of 500 gallons per minute. The Standard Co. will also use electricity for the compressor. Twenty-six drills are in operation.

The Snow Storm M. Co., near Mullan, is putting in a 2-drill compressor at No. 3 tunnel, to be run by water power. It is expected to complete the tunnel by July 1.

The Ranger tunnel on the Wyoming cut the foot wall of the vein last week. The tunnel is in 2125 feet.

The Atlas M. Co., operating claims on Stevens peak, near Wallace, has let a contract to drive the tunnel 500 feet. Three hundred and fifty feet of work has been

done on the property. The lead was cut by a crosscut tunnel.

WASHINGTON COUNTY.

W. T. Getty, superintendent of the Con. Copper Co. at Mineral, says the compressor is on the ground and he expects to have the smelters in operation Feb. 15th.

KANSAS.

ALLAN COUNTY.

The Standard Oil Co. has completed its 28-mile pipeline connecting the field at Iola with refinery at Neosho. One year ago there was not to exceed twenty wells in the field, now there are 200. The Neosho Valley Oil, Gas and Mineral Co. completed their No. 16 last week. They finished cleaning and shot their No. 13 on the same date.

NEOSHO COUNTY.

There are forty drilling rigs in operation in the oil fields of southeastern Kansas. The McKinley Oil & Gas Co. completed its well No. 5 last week and shot it with forty quarts of nitroglycerine.—G. Z. Work has shot his well No. 4.—The Kansas Crude Oil Co. has brought in No. 13 on the Mann lease.—The Chanute Crude Oil Co. brought in No. 8, on the Haum farm, recently.—Mr. O'Neill brought in a gasser on the Morrison farm, west of Chanute.—The Commonwealth Oil Co. of Taylorville Ill., has completed its second well on its lease adjoining the Keystone property.—The American Oil Co. brought in No. 6 recently.

LOUISIANA.

CALCASIEU COUNTY.

W. R. Childs and S. M. Scott of the Central Oil Refining Co. have arranged to build an oil refinery at Welsh on the Southern Pacific Railroad, to have a daily capacity of 500 barrels.

MICHIGAN.

HOUGHTON COUNTY.

It is said the 6-head Hecla mill, which the Calumet & Hecla M. Co. is building as an addition to the Lake Linden plant, will operate with 40% of the water ordinarily required for the amount of rock treated. All waste sand from the Calumet & Hecla plant will be elevated by a 65-foot sand wheel, from the top of which it will be discharged through launders into the lake.

The decrease of 1,290,720 pounds in the copper output of the Quincy mine, near Houghton, as compared with the product for the previous year, was due to decrease in copper contents of rock, which have decreased from twenty-three pounds per ton to twenty pounds. The cost of production in 1901 was 8½ cents per pound; the cost last year was less.

The Wolverine mine, near Houghton, produced for 1902 6,150,000 pounds of refined copper.

The December product of the Mohawk, at Houghton, one head running nineteen days, amounted to 150 tons 1300 pounds, being equal to thirty-five pounds of metal to the ton of rock stamped.

It is difficult to determine the value of the copper production of the Lake district in 1902. Most of the Lake mines sell direct to consumers, sometimes under the market price and sometimes at a slight advance. Estimating the market value of the 1902 production at the current selling price for the year, the Lake Superior output was worth \$19,500,000. Dividends from this production amounted to 12% of the gross value. To date the Lake mines have produced 3,002,679 867 pounds of fine copper, which sold for \$461,117,304. The dividend disbursements of Lake Superior mining companies to the close of 1902 have been as follows: Atlantic, \$940,000; Calumet & Hecla, \$79,850,000; Central, \$1,970,000; Cliff, \$33,518,620; Copper Falls, \$100,000; Franklin, \$1,240,000; Minnesota, \$1,820,000; National, \$320,000; Osceola, \$4,407,000; Pewabic, \$1,000,000; Tamarack, \$3,490,000; Wolverine, \$990,000; Phoenix, \$20,000; Quincy, \$13,570,000; Ridge, \$100,000; total, \$117,335,620. The Calumet & Hecla has furnished 68%, the Quincy 11% and the Tamarack 7% of the total profits returned to shareholders. In 1902 the total dividend disbursements of Lake Superior copper mines was \$3,440,000, compared with \$7,496,000 during the previous year, the decline in the price of copper being the cause. The profits in 1902 were much larger than the amounts distributed to shareholders, but the surplus funds were largely added to, notably in the case of the Calumet & Hecla.

MINNESOTA.

SAINT LOUIS COUNTY.

The Cleveland Cliffs Iron M. Co. has made a find of iron ore on the Western Mesaba range, where a body of high-grade ore has been found. The option for the lease covers eighty acres. The com-

pany claims the mine shows up 2,000,000 tons of ore, which runs 58% to 60% iron and is low in phosphorus. The property has a depth of 115 feet in ore.

MONTANA.

CASCADE COUNTY.

The Conrads of Great Falls are reported to have bought 600 acres of coal lands at Belt, adjoining the properties of the Anacoda Co., for \$35,000.

SILVER BOW COUNTY.

Suits in which damages aggregate \$134,500 have been filed in the United States court against the four principal smelting companies at Butte because of alleged pollution of the waters of Silver Bow creek by tailings from the smelters.

MISSOULA COUNTY.

The Bitter Root Copper M. Co., composed of Minnesota men, propose to erect a \$500,000 smelter, but are asking for a subsidy in the way of a site. Manager W. Q. Ranft in Butte says the Bitter Root C. M. Co. owns a group of claims near St. Regis, among which are the Richmond and Monitor mines, both yielding copper and gold.

NEVADA.

ELKO COUNTY.

At White Rock the Edgemont Co. is employing forty-five men and has its 20-stamp mill in operation. Thirty men are employed in the Curious mine and ten stamps are dropping there. The Riddle mine has been bonded by Eastern men for \$100,000.

HUMBOLDT COUNTY.

(Special Correspondence)—C. S. Vadner, of Salt Lake City, Utah, has closed a deal for the transfer of twenty claims in the Kennedy mining district, owned by Mr. Vadner and the Blossom estate, for \$70,000. In November, 1902, Mr. Vadner interested a Philadelphia company, headed by W. Cramp, of the shipbuilding firm of Cramp & Sons, with J. W. Grange, S. B. Stinson and G. P. Schober in his mines. Mr. Vadner is retained as superintendent. The company will put in a complete plant. The high grade ores will be shipped to Salt Lake and the low grade ores reduced at the mines. Twelve men are at work. The number will be increased to fifty.

Winnemucca, Nev., Jan. 12.

The California-Nevada M. Co., driving their Victor tunnel, expect to cut the vein next week. A 100-ton mill will be erected near the tunnel and a 40-ton mill at the Arizona mine, at Unionville.

The company owning the nitre deposits near Lovelock has been reorganized.

LINCOLN COUNTY.

Near Searchlight, R. Bowman has finished his contract of sinking 65 feet in the shaft on the Encinitas. The books of the deputy recorder of the district show a total of fifty-two entries during the month of December.

Work is resumed in the mines of the Quartette Co. at Searchlight and drifting is being done on the 600 level. The station at the 600 level is completed and a 26,000 gallon tank is being put in. The mill at the river will be started as soon as the bins can be filled.

LYON COUNTY.

Gypsum from the deposit at Mound House is being used in Reno for the manufacture of plaster.

NYE COUNTY.

On the Tonopah Fraction, near Butler, the hoisting plant of shaft No. 1 has been removed to shaft No. 5, and sinking the latter to a depth of 550 feet begun. From here connection will be made with the 400 level of the three-compartment No. 2 shaft.

The O'Meara-Lynch Co. is taking out ore running \$150 to the ton, at the Alpine group on Lone mountain.

STOREY COUNTY.

At the Brunswick lode, near Virginia City, they have completed enlarging drill hole No. 3 to receive the 7-inch casing, and drilling is resumed.

WASHOE COUNTY.

The Galena Hill G. & S. M. Co., owning the Shannon group, 2 miles from Steamboat, has bought the Monte Carlo.

WHITE PINE COUNTY.

The Rocco-Homestake Co., at Hamilton, is reported to have opened a body of carbonate ore containing values in silver and lead.

NEW MEXICO.

LUNA COUNTY.

The pneumatic concentrator erected at Cooks is to be doubled in capacity.—The contractors who have been trying to

drill an oil well at Deming for the El Paso-Deming Oil Co., are reported to have quit.

OREGON.

BAKER COUNTY.

Superintendent L. C. Beckwith at the Orleans mine, near Sumpter, says the two crosscuts driving on that property have reached the north and south veins. The north vein has 2 feet of ore and the south vein 10 feet. The last 20 feet in the tunnel opened up a shoot.

The Ross Gulch mine is reported sold to Spokane men for \$65,000. The shaft is down 165 feet, with short drifts on the Ross Gulch claim. The sale also includes the Richmond 10-stamp mill and a hoist with a capacity of 1200 feet depth. There is a smaller hoist on the Ross gulch, which has a capacity of 300 feet.

J. H. Robbins, C. C. Robbins and O. C. Wright have incorporated the Baltimore M. Co. to operate the Baltimore group of five claims on Buffalo mountain, on Granite creek.

E. G. Stevenson, H. Holcomb and T. McEwen have incorporated the Blue Mountain G. M. Co. to develop five claims adjoining the Phoenix, Don Juan and Virginia mines near Greenhorn city.

Five shifts of miners are at work on the Dixie Meadows mine, three shifts in the lower tunnel and two in the second level. The lower tunnel is a crosscut, driven to tap main ledge at 500 feet depth.

A two-drill compressor is being put in at the Chloride mine on the Rock Creek slope, near Sumpter. A tunnel is being driven.

Two ore stringers have been cut in the St. Patrick mine, near Sumpter. One is 1 foot in width with talc walls. The main lead is near the face of the crosscut.

C. W. Keizur, M. L. Keizur and Estella Keizur have sold to the Cardwell G. M. Co. six claims in Stice Gulch district, between Sumpter and Baker City.—C. H. Barnard has sold to the Cracker Eagle M. Co. the Pearl placer claim in the Cahle Cove district.—W. Cooper has sold his interest in the Monarch and Oreole property of the Quartzburg district to N. C. Haskell of Baker City.

The tunnel being driven on the Tammany property, near Sumpter, owned by the Northwestern C. I. & L. Co., is in 135 feet, says Manager Butze. The tunnel is in a milling ore, 12 feet wide, that assays \$1 to \$7. The main vein is 30 feet wide. The four claims owned by the company join the North Pole ground. Manager Butze says machinery will be installed.

Fifteen stamps are dropping in the Goldconda mill, near Sumpter, and the other five will be added as soon as the hoist is ready to raise ore from the lower levels. Some ore is being shipped.

The Nine Strike, Nos. 2, 3 and 4, on the Nine Strike vein of the mother lode section, near Sumpter, have been sold to Eastern men for \$15,000. W. T. Young is manager.

The Sanger G. M. Co. has been incorporated to operate the Sanger mine in Eagle Creek district. F. W. Paine, J. E. Bingham, J. K. Romig, F. A. Moore, P. Basche, L. A. Lewis, C. P. Berkey, W. A. Lindsay, W. M. Pierce, J. K. Romig is superintendent.

JOSEPHINE COUNTY.

A 25-foot vein of coal is reported on Dutcher creek, 12 miles from Grants Pass.

The Granite Hill mines of Louise creek district, 8 miles north of Grants Pass, have been bought by the American Gold Fields Co. of Chicago. The deal comprises 800 acres of mineral land, both quartz and placer, together with a 5-stamp mill, concentrator and other equipment. The placer mines are equipped with hydraulic plant, with 7 miles of ditches and flumes, hundreds of feet of pipe and two giants. There are over 600 acres of placer ground in the Granite Hill diggings. W. J. Morphy is manager of the company. The Granite Hill mines have been worked for two years past by C. L. Mangum. The new owners, under the direction of their consulting engineer, W. Devarila, will develop the Granite Hill mines and expend \$75,000 in opening and equipping them.

MALHEUR COUNTY.

Oil is said to have been struck 8 miles from Vale in two wells. Five holes were drilled, and on claims of the Union Co. and of the Zenith Oil Co. oil was found. The oil was struck on the Union Co.'s ground at 100 feet and the Zenith Co. at 150 feet.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Oro Hondo M. Co., at Lead, whose property joins the Homestake on the south, have the three-compartment shaft down 200 feet. The hoist in operation is designed for a depth of 2000 feet.

A 20% payment has been made by the

Lucky Strike M. Co. on the 210 acres of mineral land bought near Custer peak, 7 miles south of Lead. The property is 1½ mile from the Uncle Sam mine of the Clover Leaf G. M. Co.

According to the report of State Mine Inspector T. Gregory, the total number of miners and mill men employed in the Black Hills for ten months of 1902 averaged 3207, two-thirds of whom were employed by two companies, the Homestake and Golden Reward. It took 1700 men to produce the output of the Homestake, 1,218,089 tons. Total number of tons produced in the Hills in ten months were 1,621,601, valued at \$7,342,227, averaging \$4.60. The average production per man a month for the ten months on the Homestake was seventy-two tons; on Golden Reward, forty tons; all others, same time, twenty-two tons.

A bar of gold bullion valued at \$16,000 was deposited in the United States assay office at Deadwood by the Spearfish G. M. & R. Co. January 2, the result of fourteen days' run at the cyanide plant in Johnson gulch.

The Potsdam G. M. Co., adjoining the Spearfish and Deadwood-Standard properties in the Ragged Top region, is reported to have opened up an 11-foot body of ore.

The Deadwood-Standard G. M. & M. Co., which owns 225 acres of patented ground in Ragged Top mining district, adjoining the Spearfish Co.'s territory, has decided to double the capacity of its mill. The mill at present has a capacity of from 100 to 125 tons of ore daily.

TEXAS.

JEFFERSON COUNTY.

The oil production of the Beaumont field for 1902 was as follows:

	Barrels.
January.....	546,881
February.....	687,961
March.....	813,794
April.....	851,178
May.....	932,411
June.....	1,421,268
July.....	1,036,915
August.....	1,217,779
September.....	828,815
October.....	1,114,065
November.....	937,791
December.....	1,117,624

Total.....11,506,482

The Gulf Refining Co. of Pittsburg, Pa., is erecting at Port Arthur an oil refinery to cost \$1,500,000, and it is expected to be in operation within three months. The Port Arthur refinery will have fifty-eight stills of 1000 barrels capacity each. Twenty-five of these are in use. The plant will have sixteen tubular boilers, fired with oil, and ten agitators to finish the reduction of the product. The entire plant is fed and relieved from 100 tanks, of capacity ranging from 500 barrels to 55,000 barrels each.

HARDIN COUNTY.

A. Merchant has sold 225 acres in the Sour Lake oil field to F. D. Coe of Dawson City for \$50,000. T. Mendelssohn is building a derrick on lot 6 in the Parsons tract. The Guffey Co. has completed the pipe line to Spindle Top, and as soon as pumps are placed will begin to deliver oil to their refinery at Port Arthur.

UTAH.

BEAVER COUNTY.

Superintendent Farish, of the Old Hickory mine of the Majestic Co., reports having cut the ore body at 200 feet in the tunnel. A streak of smelting ore running 40% copper appears in the vein. The tunnel will be continued until it comes in under the shaft. Superintendent Tarbet, at the Estella, states that a body of gold-bearing carbonate of iron has been broken into on the 200 level. According to Tarbet, the whole face of the drift is in ore.

F. H. Lathrop of Salt Lake has an option on the Margaret Williams group, near Milford, for \$45,000. The group adjoins the Old Hickory on the southwest and consists of eight claims. It is Lathrop's intention to sink the 30-foot shaft to 100 feet.

Last week the shaft being sunk on the Erie, near Beaver, cut the vein at 130 feet. At 150 feet a drift will be driven. The ore is iron-copper sulphide.

GRAND COUNTY.

The Toledo G. M. Co. has incorporated. T. R. Black, F. G. Carthey, J. A. Largent, I. Clive, F. Beck, M. I. Fowler and G. L. Nye, to develop mines in the Miner's Basin district.

JUAB COUNTY.

Manager O'Donnell, of the Utonian of West Tintic, says the upraise run to connect the second and third levels is through. This work was necessary to improve air in the lower workings.

Drifting on the vein is resumed on the third level.

During 1902 there were 47 cars of concentrates and 40 cars of bullion shipped from the Mammoth mill and 400 cars of ore from the mine. The Grand Central marketed 463 cars. The largest tonnage was shipped from the Dragon Iron mine, which sent 472 cars. Other Mammoth and Silver properties shipped as follows: Carissa, 268 cars; Lower Mammoth, 153; South Swansea, 122; Swansea, 107; Tesora, mine and mill, 93; Ajax, 61; Victor, 51; Star Con., 46; Mordue Iron, 14; Alaska, 12; Sioux-Utah, 8; Laclede, 5; Martha Washington, 3; Showers, 3; Rabbit's Foot, 2; Undine, 2; and one each for the Boss Tweed, Boston & Tintic and Utah.

S. E. Ware, superintendent of the Swansea mine at Tintic, has a lease on the Sunbeam.

It is reported that D. A. Depue has a lease on the entire Carissa mine, near Eureka. Heretofore the ground has been distributed among eighteen leasers.

Manager Joseph says he expects to be sending Carissa ores out through the Sioux-Ajax tunnel, Tintic district, next week.

In the properties of the Snowflake M. Co., Tintic district, a body of quartz carrying manganese has been cut in the ledge, running northwest and southeast. Manager Hatfield says he is northwest on the ledge, connection with it having been made on the 700-foot level.

The Joe Bowers mine of Diamond, Tintic district, has been leased to G. Paxton. The shaft is down 400 feet. At the west the ledge was cut 50 feet from the shaft but it only showed a mineralization. On the east connection with the ledge was made at 300 feet from the shaft.

From the Centennial Eureka, Tintic, 225 tons daily are being taken out and shipped to the smelters. Manager Allen says 170 men are on the payroll.

PIUTE COUNTY.

There were twenty-three notices of location filed with the District Recorder at Kimberly January 1st.

A company of Chicago men have bought the Copper Queen and Gold Diamond groups of ten claims on Deer creek, near Kimberly. The former owners run two tunnels on the property, to cut three ledges which appear on the surface. One of the tunnels has cut two veins and the other in 150 feet is expected to cut the largest of the three ledges at 200 feet. The new company will begin developments next week.

SALT LAKE COUNTY.

A strike of ore is reported in the Mountain Lake mine, above Brighton, and shipments will begin. From the breast of an old tunnel which was in 700 feet, a crosscut was run to the northwest, and at 100 feet the ledge was found.

The Ben Butler Co. has bought the Pride of America and Bullock Fraction lodes, adjoining the Ben Butler group on the east, near Bingham. Assays made on the ore recently found in the Mystic Shrine lower crosscut and upraise show \$6 in gold, 25 7 ounces silver, 7% lead and 2 2% copper per ton. On account of bad ground, but 29 feet were made in the lower tunnel in December.

The Dewey mill at Bingham is shut down and Manager Beemus says the greater portion of the mill would be remodeled before resuming. While no new machinery will be added, changes will be made to lessen the labor and admit the easier handling of the ore.

The holdings of the Gypsy Blair M. Co. at Alta are sold to the Kennebec. With this addition the Kennebec controls about 340 acres. The upper workings are to be abandoned and the Gypsy Blair ledge tapped through the Read & Benson tunnel, which will cut it at 1000 feet below the surface. The Kennebec Co. has bought the water right at "Mill D," and at that point will install the power plant for its entire system.

It is reported from Pine the lower tunnel of the Copper Boy last week cut a vein of cyaniding ore, carrying \$6 in gold, nine ounces silver, 2% lead.

SUMMIT COUNTY.

Manager A. H. Mayne of the Minola M. Co. at Park City says the shaft below the tunnel level, which is down 200 feet, has cut a body of sulphide ores. The point at which the change occurred is at a vertical depth of 350 feet from the surface.

The zinc reduction plant at Park City has resumed. The plant begins on eighty tons of ore daily; to be increased to 100 tons.

The shaft to the 2000 at the Ontario, at Park City, has been retimbered and men are cutting the station and sinking a sump, after which drifting will begin.—At the Nalldriver Superintendent H. Campbell has the hoist completed and is

putting the engine and compressor in place.

The strike in the Quincy of the Daly-West Co., at Park City, reported by Manager Kirby, is in the crosscut through the porphyry dike on the 400-foot level, and assays show 250 ounces in silver, 30% lead, 6% copper and \$3 in gold. Kirby considers this ore a continuation of the shoot on the 200 level.

TOOELE COUNTY.

At the Grand Cross mine at Stookton ore has been opened up in a 60-foot upraise from the tunnel at 700 feet from the tunnel opening. Manager Reuhousen says the ore carries silver and lead, and that the strike was made in a cross fissure, which intersects the main fissure which the tunnel is to cut.

WASHINGTON.

CHELAN COUNTY.

Manager R. D. Johnson, the Chelan Transportation & Smelting Co., which has a bond on the Holden mine, in the Chelan district, says the company will build a smelter at the Holden to cost \$100,000. Forty men are employed on development work.

FERRY COUNTY.

W. F. Newton, superintendent the Mineral Hill Co., has eleven men working on two shifts on the company's group of twenty-four claims on the east side of the Kettle river, 1 mile south of Danville, near the Canadian boundary. He is operating in two places for the development of the Copper Bullion. The principal work is a shaft 108 feet deep, from the bottom of which a drift has been driven on the vein 300 feet. A crosscut from the bottom of the shaft has intersected the vein 6 feet wide. A stope is started from the shaft and ore is being taken out on three floors. A tunnel is being run to tap the vein 100 feet below the bottom of the shaft. At 75 feet it cut the Minnehaha vein, which is the north extension of the Lucile Dreyfus. The main tunnel on the Lucile Dreyfus is in 300 feet. The winze is down 75 feet on the hanging wall.

The Pioneer-Miner says thirteen men are employed at the Lone Pine-Surprise, near Republic. In the upper workings the stopes have been raised one floor, with the roof 14 feet above the track on the main level. The southwest face samples assayed \$13.60 in gold and 86 cents in silver, and the northeast face assayed \$12 in gold \$3.80 in silver.

P. Clark, president of the Republic Con. M. Co., says their mines near Republic have resumed.

OKANOGAN COUNTY.

Superintendent W. Lewis has the tunnel on the Mammoth mine, on Whisky hill, near Loomis, in 700 feet.

WYOMING.

There are 7148 men employed in the coal mines of Wyoming.

CARBON COUNTY.

The North American Copper Co. has bought the coal mines 9 miles from Rudefeha. The coal will be used at the Ferris-Haggerty mine and will also supply the various plants of the company, being delivered over the tramway.

The average cost per foot in running the tunnel of the North American Copper Co. to unwater the Rudefeha mine, near Dillon, has been \$23, and the total cost \$35,420, not counting lumber, tools, tracks and cars, says Manager W. Bunce. The total length of the tunnel is 1540 feet. It took fifty-seven hours for the mine to drain.

The Octavia tunnel, near Dillon, is in 825 feet and four men are at work. This tunnel is being run to cut the vein that shows on the Syndicate property.

J. Malody and C. Schoonover are working on a 100-foot contract on the Hidden Treasure, near Battle. S. Edgar and R. Ledbetter have filed on eleven claims on Cow creek and begun development.

CROOK COUNTY.

Superintendent W. D. Bartlett of the Monumental Oil Co., operating in the Moorcroft field, says he has one well down 1500 feet.

FREMONT COUNTY.

The Wyoming G. M. Co. of Salt Lake City, Utah, has incorporated; T. P. Steffey, T. A. Helm, W. H. Clark, G. L. Nye and J. A. Largent; to operate the Bullion, Bullion Fraction, Good Luck, George McKay and Venus claims in the Overland mining district.

FOREIGN.

AUSTRALIA.

The prospecting of the Lake View Consols at a depth on lines recommended by the present management is said to have

resulted in an improvement in the mine and an increase in the tonnage of payable ore reserves. In April, 1902, Hoover, Feldtmann & Pritchard estimated that ore in sight in this mine was sufficient to maintain a monthly output of 6000 ounces for twelve months. Since then about 45,000 tons of one-ounce ore have been treated and at present nearly double that tonnage of payable ore is available. The main shaft of this property is down to 1300 feet and will be sunk to 1500 feet.

NEW SOUTH WALES.

Two dredgers in the Inverell district are yielding large quantities of tin. The Cope's Creek Co.'s dredger has cleaned up after a six week's run twenty-five tons of tin and the Wilberforce dredger is yielding three tons of tin per week. Both dredgers are working ground which has been worked and reworked by miners for twenty-five years. As the dredgers are only furnished with rifles for concentrating the tin, only a small proportion of the tin raised is saved.

A new company has been formed in Sydney to buy the Wonga Wonga gold mine, at Wangat. The mine was discovered thirty years ago and successfully worked for years. Owing to the ore carrying a large amount of pyrites at depth, battery treatment did not yield a profit. The ore is low grade, but the lodes are large and regular and yield large bodies of ore.

BRITISH COLUMBIA.

(Special Correspondence). — Rossland Mining Division: John H. MacKenzie's successor as general manager of the Le Roi mine and Newport smelter will probably be appointed at the meeting of Le Roi directors in London, his resignation having been in the hands of the company for some weeks.

Slocan Mining Division: New York men have bonded the Hungry Man property on Rover creek, near Slocan Junction. The group produces pyritic ore, carrying an average value in gold and copper of \$20. Six thousand dollars has been expended in development. The Republic has recently opened 4 feet of rich ore. It is close to the old shaft. After stopping out a carload of ore at the shaft another opening was made 70 feet to the west following down two streaks. These have been stripped for 30 feet and have been found to unite, forming a 4-foot pay streak. It is shipping ore and carries native silver, argentite and gold-bearing iron pyrites. It assays 200 ounces silver and \$7 gold. The first car of ore shipped from the Republic by the new owners, amounting to twenty-two tons, was sent to Nelson. The ore will average 160 ounces silver and \$8 in gold.

Lardeau Mining Division: The Copper Dollar and the Marten fraction, two gold claims adjoining the Eva on Lexington mountain, have been sold to Elwood. Ind., people, who are operating the Western Star, near Camborne. Manager J. A. Darragh says development on the Copper Dollar and Marten fraction will be on a large scale in the spring. It is reported that a strike has been made in No. 7 tunnel of the Calumet and B. C. gold mines, Limited, at the Eva mine, near Camborne. J. F. Musselman is manager. He states that No. 7 tunnel was started six weeks ago, designed to open an ore shoot on No. 2 vein at a depth of 500 feet. Machinery will be installed as early as possible in the spring.

Nelson, Jan. 6.

The Kootenay mine at Rossland has resumed shipments. During January shipments will be made at the rate of fifteen tons per day. At the mine forty men are at work. Ore is being stoped in the third level, the mine being developed for a vertical depth of 1400 feet, entirely by horizontal workings.

The Sandon Paystreak says the Democrat in Alamo basin has been closed down. There are eleven men working on development at the Idaho. Three men are employed at the Sunset and Trade Dollar. It is rumored that development on the Ruth has open up an ore shoot. The Chance closed down January 1 and will not resume until spring. The Payne has thirty men working on zinc ore. The Slocan Star has thirty men drifting and stoping. No. 5 will be under the Silver-smith workings before the end of the month. Hereafter this mine will be operated on a six-day week, all Sunday work having been stopped.

Last week a 150 H. P. electric hoist was installed at the Snowshoe mine, Phoenix camp, at the main shaft.

The coal mines at Crow's Nest pass, south of Kootenay, though tied up for six weeks by a strike, output for 1902 shows an increase of 16,000 tons over 1901. The total output amounted to 441,000 tons of coal and 112,000 tons of coke. The mines at Michel, Coal creek and Morrissey are producing 2000 tons daily.

The Trail smelter at Grand Forks has bonded the Seattle for \$97,000. Develop-

ment work has begun. According to agreement the company will expend \$1000 per month in development. The Seattle is on the west side of the North Fork a few miles below the Volcanic mine.

J. Thompson et al of Fort Steel has a lease on the upper portion of the Invicta placer on Wild Horse creek, together with the lower ditch which carries 1000 inches of water.

Official statistics of southeast Kootenay for 1902 record as follows:

Mining claims recorded.....	253
Certificates of work.....	453
Certificates of improvements.....	12
Free miner's certificates.....	563
F. M. C. to companies.....	8
F. M. C. special.....	7
Mining leases issued.....	16
Mining leases in force.....	25
Mining leases renewed.....	2
Water grants.....	14
Pre-emptions recorded.....	89

The following are the figures for 1902 of the output of coal from the Vancouver Island collieries and the foreign shipments of the New Vancouver Coal Co:

From the New Vancouver Coal Co.:	
Gross output, tons.....	491,302
Shipments, tons.....	401,139

From the Dunsuir collieries:

Wellington mine, tons.....	400,568
Comox mine, tons.....	393,747

Of the total output of 1,291,617 tons a portion was turned into coke at Comox, producing 15,800 tons of coke. The yield for 1901 was 1,261,774 tons. The coke yield of Comox showed an increase of 402 tons over 1901.

Shipments from Rossland camp for the week ending Jan. 9 were:

Mine.	Tons.
Le Roi.....	3,038
Center Star.....	1,110
War Eagle.....	810
Giant.....	50
Velvet.....	50
Kootenay.....	30
Total.....	5,086

By a vote of 245 to 101 the employees of the Le Roi mine at Rossland have decided to adopt the proposal by the management to cease work on alternate Sundays. The Le Roi mine has decided to increase its monthly tonnage by 4000 to 6000 tons, which will make the monthly output 20,000 tons. The Black Bear stope, the extreme western workings on the south vein, has been opened up. At present 360 men are at work. The mine has 37,000 tons of high grade ores in the smelter yards, and the lower grade will be mixed with this reserve, as the matte turned out at the smelter has been carrying values in excess of the company's contract with its refiners.

Of the big mines in the Rossland camp the Le Roi is the only one that has had a continuous year of activity. The Le Roi No. 2, at Rossland, for the first eleven months of 1902 produced 83,076 ounces of gold, 146,449 ounces of silver and 6,697,022 pounds of copper. The profits announced by the management of the Le Roi mine and smelter for the entire year aggregate \$1,000,000. The mine distributed \$463,150.90 in wages to its Rossland employees and \$396,478.31 to its employees in the smelter at Northport.

R. Allen has taken the contract for rawhiding 500 tons of ore from the Hunter V., near Ymir. He has a team of six horses and expects as soon as the trail is in shape to bring down a ton per horse each trip. The rawhiding trail from the mine down the Hidden creek side of the divide has been abandoned and the ore will be brought down by Porcupine creek. The railroad company intends to put in a switch near the Porcupine bridge.

KLONDIKE.

Pipes have been sunk in the El Dora dog gusher, near Dawson, and the work of filling the shaft is reported under way. Eighteen feet of material have been deposited in the bottom of the shaft around the pipes, which are two hydraulic iron pipes, each 8 inches in diameter. They reach to the bottom of the shaft. On the base of each pipe is a large, cylindrical steel vessel, perforated to admit the full flow of water. The cylindrical base is made of heavy steel to resist the side pressure. At the surface the pipes bend and the diameter of each is reduced to 4 inches. The 4-inch portions are short and in them are fixed gate valves to regulate the flow of water.

C. Cole of London, representing English capital, has installed 15 miles from Dawson the largest hydraulic plant taken to the Klondike. The plant will be placed in operation next summer to sluice a number of Bonanza creek claims.

Gradually companies and large hydraulic plants are supplanting the individual miner in the Klondike. The richest placers have been worked out and according

to Cole it is only by hydraulic means that the remaining ground can be made to pay.

MEXICO.

The report of Consul-General A. D. Barlow says the State of Sonora has American capital invested in mining amounting to \$27,800,000, and Chihuahua comes next with \$21,000,000.

The number of smelters in Mexico is increasing. In addition to the smelters at Aguascalientes, Monterey and San Luis Potosi, new works are being built in Guaymas, Avino, Tepeyanualco, Viesca and Saltillo costing \$200,000 each. Four of the smelters have a daily minimum capacity of 600 tons and up to double that tonnage if the ores are supplied. It is proposed to build smelting works in San Luis Potosi, Matohuala and various points in Jalisco, Chihuahua and Durango. The erection of a large smelter in Monterey in connection with the foundry has commenced and is to cost \$500,000; also a smelter is to be built by the Yaqui S. & R. Co. in the Ures district, Sonora. The equipment for the latter is being shipped from Chicago by the Allis-Chalmers Co.

CHIHUAHUA.

S. Dedrick, superintendent of the Sierra Boluda mine, says ore running .83 ounce gold and 17 ounces silver is being taken out. The development work consists of two shafts and a tunnel. No. 1 shaft is down 130 feet and No. 2 180 feet, and the tunnel is in 25 feet and will run 250 feet to crosscut the vein. This property is bonded to the Camrose Syndicate, Ltd., an English corporation; A. F. Nathan general manager.

The Torreón smelter is to increase its capacity to 1000 tons daily by adding two furnaces of 175 tons capacity.

SONORA.

J. C. Underwood, general manager of the gold mines at Yerkes Camp, in the Altar district, reports the installation of a 20-stamp mill, a 60-ton cyanide plant, a 50 H. P. engine, steam hoists and other machinery.

The Gold Coin P. & D. Co. at San Javier have their 50-ton smelter in operation. For fuel they use the natural coke from La Barranca, 4 miles away, which is delivered at the furnace for \$7.50, Mexican, per ton. Some of the ores require concentrating, and a mill will be put up.

QUEBEC.

The New England Asbestos M. & M. Co. has bought the property of the Canadian Asbestos Co., Ltd., at Black Lake, and that of the Beaver M. Co. at Thetford. Although the Canadian Asbestos Co. has sold its mine at Black Lake, it will continue its present business in Montreal.

GALICIA.

On Jan. 8th, in a fire at the oil wells of Boryslav, twenty-seven springs were affected and twenty houses destroyed. The damage is estimated at \$110,000.

SOUTH AFRICA.

Colonial Secretary Chamberlain and leaders of the mining industry at Johannesburg have arrived at an agreement in the matter of financial settlement, under which the Transvaal war contribution will amount to \$150,000,000, which is to be expended in public work in the Transvaal and Orange River Colony. Regarding the labor question, it is believed the Imperial Government will consent to the importation of Chinese laborers for the mines.

The report of the De Beers Con. Mines, Ltd., of South Africa, for last year, shows gross earnings of \$23,435,970, and net of \$10,813,545. With other income from investment equal to \$601,140, and a previous surplus of \$6,386,705, the total funds available were \$17,801,400, from which were paid life governors' remuneration of \$1,582,970, and dividends and bonuses of \$12,220,000, leaving a surplus of \$3,993,430.

PERSONAL.

W. H. W. HAMILTON has returned to Sumpter, Or., from the East.

D. A. McDONALD leaves Berkeley, Cal., on the 19th for Valdez, Alaska.

W. VINCENT is superintendent of the Hull mine, near Groveland, Cal.

W. D. ARNOLD of Georgetown, Colo., has gone East on mining business.

C. W. HASKELL is manager the Melrose G. M. Co., near Florence, Colo.

F. LUNDSTRUM of San Francisco, Cal., is examining mines in Tonopah, Nev.

W. A. HILDRETH, president of the

Oriole M. Co., is at the mine near Angels, Cal.

F. A. ENOS has resigned as manager the Bellevue mine, near Sonora, Cal.

T. FAIRCHILD is superintendent of the Manhattan mine, near Robinson, Utah.

J. H. MACKENZIE has resigned as manager Le Roi mines, Rossland, B. C.

W. CAMPBELL is superintendent the Owenby Leasing Co., Cripple Creek, Colo.

S. TURNER is superintendent of the Calumet & Bisbee D. Co. mine, near Bisbee, Ariz.

C. F. MASEY, superintendent of the Iron Springs mine at Iron Springs, Idaho, is in the East.

JAS. BARTREM has resigned the superintendency of the Prosperity mine, Prescott, Arizona.

W. E. THORNE, formerly of Georgetown, Cal., leaves Denver, Colo., on the 21st for Alaska.

C. L. LANG of Sonora, Cal., is superintendent Con. North Star-Carlotta group, near Carters, Cal.

I. G. SHEPPARD has returned to San Francisco from examination of mine property at Selma, Cal.

W. Q. BROWN, manager of the Coeur d'Alene M. Co., has returned to Murray, Idaho, from Oregon.

E. P. WHEELER, manager of the Mineral Hill mine, near Concouly, Wash., is at Whitingham, Vermont.

J. O'REGAN, superintendent of the Last Chance mine, near Sandon, B. C., has gone to New Brunswick.

B. BLANCHARD, superintendent of the Iron King, near Val Verde, Ariz., has returned from New York City.

MANAGER M. SIDNEY of the East Argentine M. Co., Georgetown, Colo., has gone East on company business.

F. J. MARTIN, superintendent of the Fortuna mine, near Yuma, Ariz., has returned from San Francisco, Cal.

W. B. DEVEREUX, of Colorado Springs, Colo., consulting engineer Melones M. Co., Melones, Cal., is at the mine.

GEO. W. INGLIS, representing the Stilwell-Bierce & Smith-Vaile Co., Dayton, Ohio, is in San Francisco, Cal.

T. H. OXNAM has gone to London to attend the annual meeting of the Palmarajo and Mexican Gold Fields, Ltd.

W. NEBEKER has returned to Salt Lake City, Utah, from examining mining properties in Mexico and Arizona.

W. F. SNYDER, manager of the Western Exploration Co. Balakala mines, near Keswick, Cal., is in Salt Lake City, Utah.

MANAGER W. BUNCE and Auditor A. E. Loizeau, of the North American Copper Co., Dillon, Wyo., are in Denver, Colo.

W. E. C. EUSTICE, of Boston, president Melones M. Co., Melones, Cal., is in San Francisco, Cal., from a trip to the mines.

G. C. GILL, of Holyoke, Mass., president of the Shannon Copper Co., at Clifton, Ariz., has returned from a visit to the mine.

N. J. SORESENSEN has resigned the management of the Maxwell mine, of the Elkhorn Con. G. M. Co., in Rock Creek district, Or.

F. R. CULBERTSON of San Francisco, Cal., general manager of the Chloride-Bailey mine, near Trinity Center, Cal., is at the mine.

F. D. FRENCH is manager the Owenby Leasing Co., operating the Pharmacist, Acacia and Isabella properties, Cripple Creek, Colo.

MR. CORBOULD has resigned the management of the Hannan's Reward-Mount Charlotte mine, Kalgoorlie, Western Australia.

E. H. BENJAMIN of San Francisco, Cal., is at the Golden Eagle mine at Hayden Hill in Lassen county, Cal., of which he is consulting engineer.

W. M. NESBIT, of Tintic, Utah, has accepted the position of manager the Cortland group of mines in Gold Brick district, Gunnison county, Colo.

S. H. LUCAS, general manager Cuyamaca & Stonewall Ranch M. Co., has gone from Los Angeles to Cuyamaca, Cal., to open up the Stonewall mine.

J. T. MILLIKEN, formerly chemist for the Imperial G. M. Co. at Deadwood, S. D., is mill superintendent for the same company, vice W. B. Milliken, resigned.

K. YAMAGUCHI, Ph. D., representing the Furukawa Central Office of Mines at

Tokio, Japan, is in British Columbia looking into copper smelting methods.

H. HOLMAN is superintendent the Wedekind mine, near Reno, Nev., vice C. L. Crane, resigned. He will also act as superintendent of the Desert King mine.

S. BAMBERGER has resigned the position of president and general manager of the Lower Mammoth mine at Tintic, Utah, to devote more attention to his De Lamar mines in Nevada.

WM. STEPHENS is superintending the construction of a complete hoisting plant for the Joshua Hendy Machine Works, on the property of the Fresno Copper Co., of which H. B. Varcoe is manager, near Clovis, Cal.

S. A. JOSEPHI, manager American Exploitation Co., Denver, Colo., with E. M. Farr, representing Washington, D. C., capital, have returned from Kingman, Ariz., where they had been investigating the Gold Creek M. Co.

Books Received.

"A Treatise on Roads and Pavements" is the latest volume on this important subject. The author, Ira Osborn Baker, C. E., is an authority on this subject, and also on masonry. The book consists of 655 + viii pages, 171 figures and 68 tables. It deals with road economics and road location. The chapter on gravel roads contains the first scientific study of road-building gravels. That portion devoted to broken stone roads is filled with practical minute details not ordinarily found in books. The chapter on asphalt pavements is very complete and contains the first discussion of the causes of failure of asphalt pavements ever published. Wheelmen will be interested in the article on bicycle paths. Price \$5. John Wiley & Sons, New York City.

Commercial Paragraphs.

ECCLIS & SMITH, Fremont street, San Francisco, have this week booked orders for a carload of Braeburn mining drill and tool steel. This firm also handle "Boyer" hammers and "Little Giant" drills.

THE California Hyd. Eng'r Supply Co., San Francisco, Cal., have shipped and are now installing a 10-stamp mill with hydraulic power at the Altadena mine, at Columbia, Cal. They are also installing a gas engine and pump at the Int Jefferson Consolidated at Chinese Camp, Cal.

THE Llewellyn Iron Works of Los Angeles, Cal., have closed contract with Messrs. Thomson & Boyle of the same place for a 100-ton ore reduction plant to go to their mine near Mojave, Cal. The plant contains three sets of their improved rolls, crusher, screens and all auxiliary machinery with complete power plant. They will erect the machinery on foundations and put up the building complete with everything ready to run. The plant is to be completed in ninety days.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CONVEYERS.—No. 717,063. Dec. 30, 1902. C. J. Allen, San Francisco, Cal. The object of this invention is to provide a simple means by which a burden carrier may be taken up at one point, moved to a place of discharge and the carrier returned to the point of beginning by gravity. It consists of a rigid inclined single track, hoisting and fall cables respectively, attached to the higher and lower ends of said track, sheaves supported in line with and at points above the respective ends of the tracks and through which said cables pass, the fall cable adapted to raise or lower in unit on with the hoisting cable, a burden carrier comprising a trolley and bucket, said trolley adapted to be easily engaged with and disengaged from said cables and having anti-frictional guides engaging the sides of the track, said bucket consisting of a hinged tilting scoop, and means for locking the bail and scoop when the latter is to be hoisted.

CONCENTRATORS.—No. 717,805. Jan. 6, 1903. J. S. Brownell, San Francisco, Cal. This invention relates to improvements in apparatus for concentrating and separating valuable heavy material from the lighter waste or gangue as applied to machines in which an endless traveling belt is mounted at an angle and gradually moved up the incline and at the same time given a shaking movement. This class of machines is sometimes called "rammers." The invention consists in certain details by which the driving gear actuating worm can be disconnected to stop the travel of the belt while allowing the shaking movement to proceed, means for mounting the worm-driving shaft, and for shifting the driving belt upon the cone pulleys to vary the speed of travel. It also comprises improvements in the spring supports

upon which the frame is mounted and the manner of adjusting the pulleys over which the pulley-carrying belt passes.

RAILWAY RAIL AND THE DISTRIBUTOR.—No. 717,830. Jan. 6, 1903. W. P. Cunningham, Coulee City, Wash. This invention relates particularly to means for distributing ties and rails along the graded roadbed. It consists of tie and rail conveyors supported at either side of the construction cars, means for driving the conveyors to send the ties and rails forward, a turntable supported above the ground, upon which the ties are delivered from the conveyor, and a wagon having a horizontal endless carrier with speeling fingers thereon, said carrier adapted to be operated in either direction, first to be loaded from the turntable and then to discharge its load at proper intervals.

MINING PUMP.—No. 717,852. Jan. 6, 1903. J. K. Hogan, Placerville, Cal. The object of this invention is to construct the pump as to avoid the use of all leather valves in the plungers, and generally such parts as are liable to wear and deterioration by the constant action and lifting of a heavy column of water, a means for connecting a series of pumps with pump rods or pitmen common to all of the series, and in so arranging the alternate movements of the pair of pump rods through which motion is communicated that the weight of each descending rod is transferred to assist in operating the ascending rod and plungers actuated thereby. This invention is especially designed for use in mines or wherever water is to be raised to a considerable elevation.

PHOTOGRAPHIC PRINTING FRAMES.—No. 717,853. Jan. 6, 1903. A. Holmes, Sacramento, Cal., one-half assigned to F. Werner of Sutter Creek, Cal. The object of this invention is to provide a frame adapted for use with films as distinguished from the glass plates used in photographic apparatus; and it is a frame of the kind designed and adapted for use with films smooth and flat in the frame while placing the sensitized paper end pre-exposed in place. The invention consists of a rectangular frame, a ledge on the inner wall of the frame opening, a pressure board adapted to rest on said ledge and having a panel portion project into the space enclosed by said ledge. There are grooves formed in the ledge, and a slot in one end of the frame coincident with said grooves, end through which a negative may be introduced into the frame.

MECHANICAL MOVEMENTS.—No. 717,901. Jan. 6, 1903. J. D. McFarland Jr., Fruitvale, Cal., one-half assigned to J. Bruckman of San Francisco, Cal. This invention consists essentially of three tracks or guides lying in the same general plane and extending in the same general direction. A switch arm is pivoted to swing from side to side against one or the other of the outer tracks. Arms are pivoted on the outer tracks and each arm is connected with the switch on the opposite side thereof, whereby the oscillation of the arm in one direction acts positively to cause the switch to oscillate in the same direction; and there is a carriage reciprocable between the ledge, and adapted to engage the switch and cause the carriage on its return movement to travel upon another track. This invention is designed particularly for an engine of the four-cycle oscillating explosive type.

EXCAVATORS.—No. 717,835. Jan. 6, 1903. W. H. Fulcher, Oakland, Cal., one-half assigned to H. Murphy of San Francisco, Cal. This invention is especially designed for excavating earth so as to form canals or ditches, and to transfer said earth from the channel and deposit it upon either side thereof. It consists of an apparatus so mounted that the bearing portion may travel upon the surface adjacent to the excavation to be made, while the excavating mechanism is adjustably supported so that it may be lowered and set to any desired depth, said mechanism being so constructed as to be consecutively loosen and take up the earth and then upon such an angle of inclination as will produce the proper slope in the sides of the channel. There are also means for opening the hockets when they reach the point of discharge, and means for insuring the discharge of the material from the buckets.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JANUARY 6, 1903.

717,547.—AIR PUMP OILER.—W. Cooper, Seattle, Wash.
717,805.—CONCENTRATOR.—J. S. Brownell, S. F.
717,807.—FLOATING FISH TRAP.—A. C. Burdick, Seattle, Wash.
717,830.—RAIL DISTRIBUTOR.—W. P. Cunningham, Coulee City, Wash.
717,740.—CAR COUPLING.—C. S. Enright, Tacoma, Wash.
717,835.—EXCAVATOR.—W. H. Fulcher, Oakland, Cal.
717,849.—WASHING MACHINE.—S. Hayes, Ellensburg, Wash.
717,852.—MINING PUMP.—J. K. Hogan, Placerville, Cal.
717,853.—PHOTO PRINTING FRAME.—A. Holmes, Sacramento, Cal.
717,955.—BOTTLE HOLDER.—W. T. Holton, River-side, Cal.
717,682.—LOADING DEVICE.—Honeck & Hopkins, Seattle, Wash.
717,683.—BUOYANT SAFE.—Honeck & Hopkins, Seattle, Wash.
717,855.—LOCK.—S. C. Houghton, S. F.
717,579.—PIPE WRENCH.—L. W. Johnson, Jerome, Arizona.
718,008.—AIR HEATER.—T. S. Lowe, Los Angeles, Cal.
717,882.—BALL AND SOCKET JOINT.—J. C. Martin, Jr., S. F.
717,901.—MECHANICAL MOVEMENT.—J. D. McFarland, Jr., S. F.
717,701.—WAGON LOADER.—J. Murphy, S. F.
718,058.—PAPER HOLDER.—A. E. Sexton, Los Angeles, Cal.
717,937.—OIL BURNER.—G. W. Smith, San Jose, Cal.
717,639.—DUST PAN.—G. C. Tichenor, Los Angeles, Cal.
717,738.—RAILWAY CURVE.—A. C. Wells, Whittier, Cal.

Latest Market Reports.

SAN FRANCISCO, Jan. 16, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22d (standard ounce, 925 fine); New York, bar silver, 47½c, refined (1000 fine); San Francisco, 47½c; Mexican dollars, 38 @ 39c San Francisco, 38½c New York.

Silver again shows a slight decline from last week's quotations.

COPPER.—New York: Standard, \$11.50; Lake, 1 to 3 casks, \$12.25; carload lots, \$11.30; Electrolytic, 1 to 3 casks, \$12.12; carload lots, \$12.00; Casting, 1 to 3 casks, \$12.00; carload lots, \$11.10. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £52 18s 9d spot per ton.

This week's prices show another small advance in prices of all grades except electrolytic.

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco, \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 6½c; pig, \$4.75. London: £11 5s per ton.

SPELTER.—New York, \$4.90; St. Louis, \$4.50; London, £20 per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$28.00@28.90; San Francisco, ton lots, 29c; 500 lbs., 29c; 200 lbs., 29½c; less 30c; bar tin, 35c. London, £125 7s 6d spot.

PLATINUM.—San Francisco, crude, \$18.00 per oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.50; large lots: London, £8 15s; San Francisco, local, \$45.50 per flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½c pure ingots, 35c; No. 2, 90½c, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 19c; San Francisco, Plumbers', 100-lb. lots, 16.10c.

NICKEL.—New York, 50@60c per lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.00; gray forge, \$20.15; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$28.00@30.00; open hearth billets, \$30.50@34.00; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	25.00@25.50
Foundry Northern 1	23.50@24.00
Northern 2	23.00@23.50
Northern 3	23.50@24.00
Southern 1	23.85@24.85
Southern 2	23.35@24.35
Southern 3	22.85@23.85
Forge	22.35@23.35
Charcoal	25.50@26.50
Billets, Bessemer	33.00@34.00
Bars, iron	1.80@1.85
Bars, steel	1.75@1.80
Rails, standard	28.00@30.00
Rails, light	34.00@40.00
Plates, boiler	1.90@2.00
Tank	1.75@1.80
Sheets, 26 store	2.90@3.00
No. 27	3.00@3.10
No. 28	3.10@3.20
Angles	1.75@1.80
Beams	1.75@1.85
Tees	1.80@2.00
Zees	1.75@2.25
Channels	1.75@2.25
Steel melting scrap	18.25@18.50
No. 1 railroad wrought	18.50@19.00
No. 1 cast, net ton	17.50@18.00
Iron rails	24.00@25.00
Car wheels	23.00@23.50
Cast borings	10.25@11.50
Turnings	14.00@14.50

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.30; Cut, \$3.30; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload

lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kgds, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; 10x, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98½-99%, jobbing, 25@26c per lb.; carloads, 24@24½c; in 10-lb. tins, 35c; sulphuric acid, in carboys, 66½ B, 2c per lb.; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 2½@3c per lb.; blue vitriol, 5½@6½c per lb.; borax, concentrated, 7@8c per lb.; chlorate of potash, 12@13c; roll sulphur, 4@6c; ground sulphur, 4@6c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2 @ 2½c; nitric acid, in carboys, 8c per lb.; caustic soda, in drums, 3@4c per lb.; Cal. s. soda, bbls., \$1.25 @1.50 per 100 lbs.; sks., \$1.05; chloride of lime, spot, \$3.00@4.00; nitrate of potash, in bbls., 8c; caustic potash, 10c in 40-lb. tins; sulphide of iron, 9c per lb.; copper sulphate, 5@7c.

CEMENT.—Germania, \$2.50@2.75; K. & B. S., \$3.00; Hewnmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.50; Seattle, \$8.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, No. 1 bbl., 95c; cs., \$1.00; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 55@57½c; cs., 57½@60c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: Five tons and over at one purchase, per lb., 6c; 1 ton and less than 5 tons, per lb., 6½c; 500 lbs. and less than 1 ton, per lb., 7c; less than 500 lbs., per lb., 7½c; in 25-lb. tin oals, 1c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs per case, 2½c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—One ton and over at one purchase, per lb., 6c; 500 lbs and less than 1 ton, per lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb.; powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c per lb.

BORAX.—Crystal, 7c; calcined, 25c.

CHROMIUM.—(90% and over) per lb., \$1.25.

COPPER.—Sulphate, 5@7c.

MANGANESE.—(90% and over) per lb., \$1.25.

MERCURY.—Bichloride, per lb., 90c.

MOLYBDENUM.—25c per gramme; 1000 grammes=2½ lbs.

PHOSPHORUS.—(American) per lb., \$1.00.

SILVER.—Chloride, per oz., 75c; nitrate, 55c.

SODIUM.—Metal, per lb., \$1.25.

URANIUM.—Oxide, per lb., \$3.50.

ZINC.—Metallic, chemically pure, per lb., 50c; dust, per lb., 10c; sulphate, per lb., 04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from C. J. Graham in Selby Hill Gravel Mine, near Nevada City, Nevada County, Cal., draining into Brush Creek which reaches South Fork of Yuba River from Princess Hydraulic Mining Co., in Princess Hydraulic Mine, near Redding, Shasta County, Cal., draining into Clear Creek which reaches Sacramento River; and from Henry Gutenberg in Gutenberg Gravel Mine, near Marysville, Colusa County, Cal., draining into Willow Creek which reaches Consumes River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., Feb. 2, 1903, at 1:30 p. m.

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Fig. 1.—Redwood Stave Pipe, Melones Mining Co.



Fig. 2.—Main Power Shaft, Melones Mining Co.

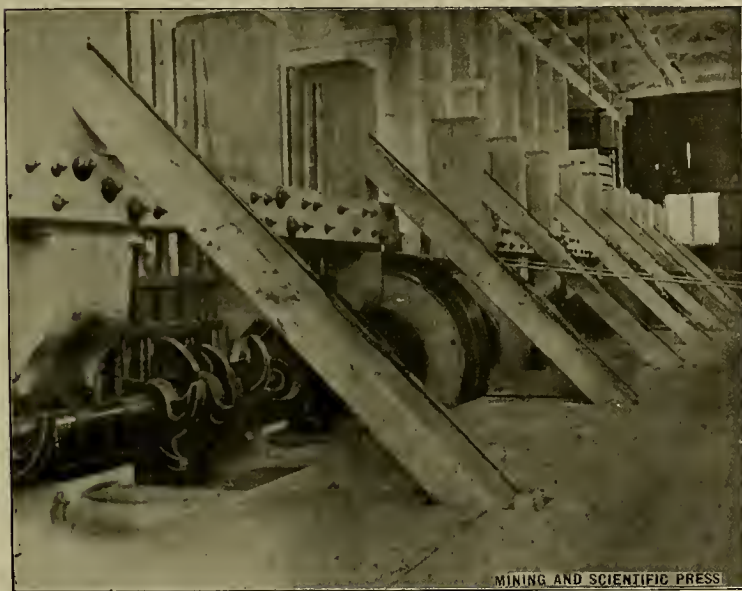


Fig. 3.—Cam Shaft, Melones Mining Co.



Fig. 4 —Battery Floor, Melones Mining Co.

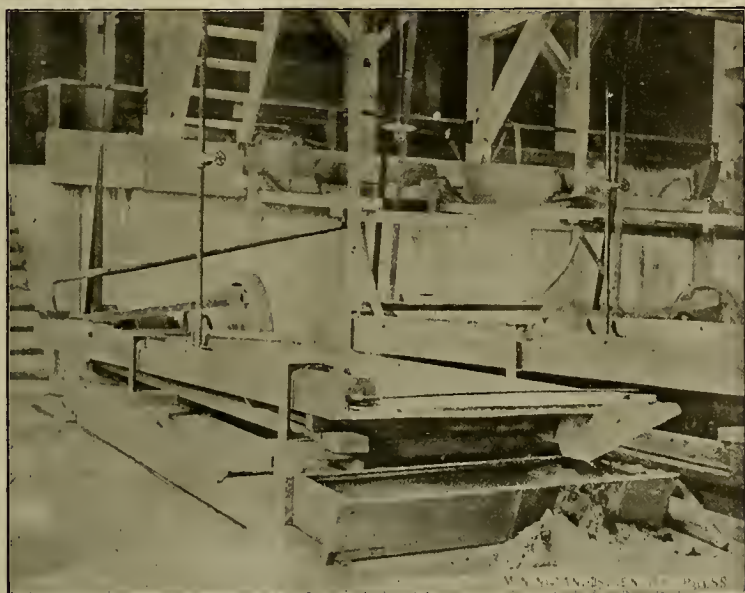


Fig. 5.—Concentrating Tables, Melones Mining Co.

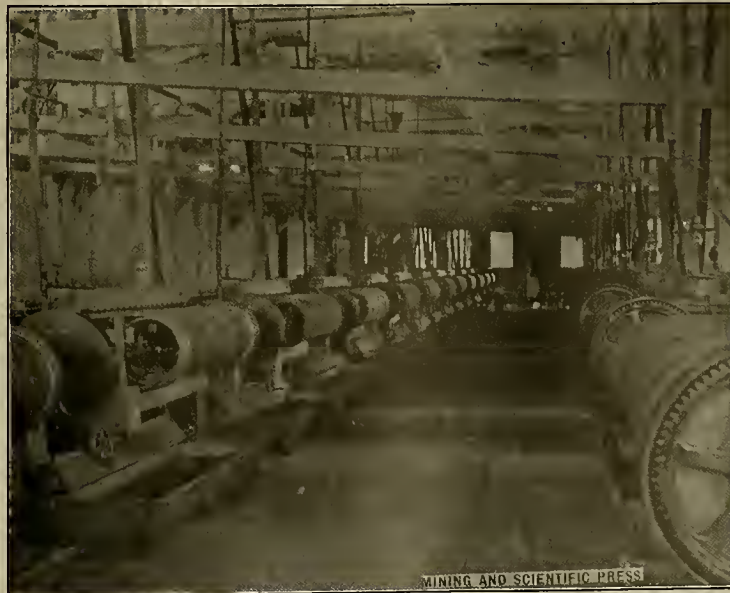


Fig. 6.—Vanner Floor, Melones Mining Co.

Milling Equipment of the Melones Mining Co., Melones, Calaveras County, Cal.—(See Page 52.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Redwood Stave Pipe, Melones Mining Co.....	49
Main Power Shaft, Melones Mining Co.....	49
Cam Shaft, Melones Mining Co.....	49
Battery Floor, Melones Mining Co.....	49
Concentrating Tables, Melones Mining Co.....	49
Vanner Floor, Melones Mining Co.....	49
Stamp Milling and Amalgamation of Free Gold Ores.....	53
Quicksilver Retort, Terlingua, Texas.....	54
Electro-Magnetic Ore Separator.....	56
Mines and Mining Building, St. Louis Exposition, 1904.....	57
Portal Mining Building, St. Louis Exposition, 1904.....	57
Mining and Metallurgical Patents.....	58
EDITORIAL:	
Gold Mining a Great Manufacturing Enterprise.....	50
A Labor Famine.....	50
An Obnoxious Bill Killed.....	50
Abating the Smoke Nuisance.....	50
MINING SUMMARY:	59-60-61-62-63
LATEST MARKET REPORTS:	64
MISCELLANEOUS:	
Concentrates.....	51
Some Data Requisite for Mining Reports.....	52
Mill of the Melones Mining Co. at Melones, Calaveras Co., Cal.....	52
Furnaces for Treating Cinnabar Ores.....	52
Stamp Milling and Amalgamation of Free Gold Ores.....	53
The Terlingua Quicksilver Deposits of Texas.....	54
A Code of Bell Signals for Mines.....	55
Changes in Granite.....	55
Crystals of Red Copper Oxide.....	55
The Dry Ores of Slocan, B. C.....	55
Mining Manganese in Colombia.....	55
Electro-Magnetic Ore Dressing.....	56
Mines and Metallurgy at the St. Louis Exposition.....	57
Precipitation of Copper Cyanide Solutions.....	57
Mining and Metallurgical Patents.....	58
Personal.....	64
Commercial Paragraphs.....	64
Catalogues Received.....	64
Books Received.....	64
New Patents.....	64
Notices of Recent Patents.....	64

Abating the Smoke Nuisance.

All great reduction works, where sulphide ores are roasted and smelted, produce great volumes of smoke and sulphurous fumes, which destroy all vegetation in their vicinity, and, if not detrimental to health, are at least obnoxious to those who have to live in the smoke and sulphur-laden atmosphere. Butte and Anaconda, Mont., are no exception to the rule, and the "smoke nuisance" has been a cause for much discussion and unfavorable comment in that section. The Anaconda Company has undertaken the difficult task of abating the nuisance, and has been making a series of experiments in that direction, it is now announced, with a probability of success. The experimenters have approached the proposition from several directions, and say they are in a fair way to lessen, if not wholly abate, the smoke nuisance. The most rational method of dealing with the proposition—that of passing the gases through a constantly falling spray of water—they declare to be inexpedient, owing to the large volume of water required, and the inability to recover the substances taken up by the water, which pollute the streams of the region—a greater evil and more widespread than that caused by the smoke. The Anaconda smelters treat about 5000 tons of ore daily and the quantity of dust and gases resulting from the various metallurgical processes is very great, but it is thought that a solution of the problem will be found in the construction of additional dust chambers.

One feature of the proposition is that prior to the erection of the reduction works at Anaconda there was practically nothing of great value there, the subsequent growth of the town and consequent value of real property being created by the metallurgical industry in operation there. Wherever smelters are in blast there is always more or less smoke, and this fact is known to all, and it would seem that as the prosperity of the country depends upon the successful and continuous operation of the reduction works that the smoke nuisance is a matter of secondary consideration, being necessarily incidental to the continuance of the industry.

An Obnoxious Bill Killed.

The passage of a joint resolution by the California legislature, protesting against what is known as the "Dick scripper bill" by Congress, is legislation that will be appreciated by miners everywhere. The Dick bill provided that the Court of Appeals of the District of Columbia should have jurisdiction over the decisions of the Department of the Interior affecting the taking up of lands on the public domain. The evident purpose of the bill was to reopen the oil land cases in Kern county, Cal., which have been decided adversely to the scrip locators since January 1, 1902, for the bill contained a provision which permitted appeals to be taken in any cases decided subsequent to that date. As the law exists, the decisions of the Department of the Interior are final in all matters affecting the location of lands on the public domain, and in all cases coming before the courts they simply affirm or follow the principles established by the Interior Department in its rulings.

Immediately after the passage of the joint resolution by the California legislature, the text of it was sent to Washington, where it was introduced into the Senate by Senator Perkins, of California, and it is understood that the Dick bill will not be reported by the Senate judiciary committee. Had this bill become a law, it would have resulted in almost interminable and expensive litigation in the Kern county oil field.

Early in 1901, Commissioner Hermann decided in the cases of the Kern Oil Co. vs. Clarke, and Gray Eagle Oil Co. vs. Clark, in favor of plaintiff. Both cases involved title to valuable lands in the Kern oil field, and the decision was affirmed by the Secretary of the Interior in April, 1902. In these decisions the Secretary of the Interior made the policy of the Interior Department in relation to lands of this character positive. The opinion of the Secretary was that the provision that forest reserve scrip selections could only be made on vacant land has reference to the physical condition of the land, and does not permit of the selection of land occupied for mining or other purposes, even though such land has not been entered at the local land office.

Many rulings had previously been made which did not look upon the occupancy of land for the alleged purpose of mining as any evidence of its real character, or proper classification as mineral land.

Much land located as mineral (oil lands, placers and veins), if not valuable for the mineral they actually or probably contain, are of little value for any other purpose, and miners do not usually locate land under the mining law without reasonable evidence, physical or otherwise, that it is more valuable for mineral than for any other purpose. The now valuable lands in the Kern river oil section laid for many years unoccupied, untitled and unvalued, and those holding forest reserve scrip would make no haste to locate such lands for agricultural purposes, or for any other purpose than to be benefited by their probable value as mineral land.

It is rarely that the absolute or even the approximate value of undeveloped mineral land can be determined, and lands in the vicinity of known mineral lands, when occupied for the purpose of mining, which means primarily the purpose of proving their value, should be recognized as mineral. This is due to the miner and is only in line with common sense.

In the case of many valuable placer mines, miners of experience decide without hesitation the probability of value underlying the surface and yet the physical aspect of the surface may convey no hint to those unfamiliar with mining of the probable or possible value underlying such surface. The decision of the Interior Department that bona fide occupation of a placer mining location shall be sufficient to vest in the locator an exclusive conditional grant, should extend to oil lands and to all other mineral lands wherein the value must be determined by exploration.

A GREAT manufacturing enterprise is gold mining! There is unlimited raw material with a constant cash demand for modern machinery. The product is wanted by everybody and there are orders ahead for many years' output no matter how great that output may be. The product sells itself. The price is fixed and unvariable—\$20.67 per ounce. Its sale needs no service of agent or intermediary; it

sells itself. Freight on it is reduced to a minimum. Its market is anywhere and everywhere. Times good or bad make no difference, except that when times are dull it sells best. No matter who else engages in the business the demand and the price are unaffected. It is a business in which there is neither competition nor combination. It is an industry that creates and maintains all other trades and interferes with none of them. Its production makes the best of home markets; its manufacture causes the creation of new wealth. It is the developer of communities, the creator of all that goes by the name of progress, development, civilization. In its wake spring up all the arts and sciences which it employs at the highest going wages. It calls to its aid the skilled service of the smartest men and offers reward commensurate with the amount and value of the effort. Better than any other manufacturing industry in the amount, the size and the permanence of its dividends, it is unaffected by trusts and is independent of and immune from the disasters to which other forms of manufacture are liable in the fact, that its product is forever sought in unlimited quantity, for it sets the standard of the world's wealth. The sale of its product is stripped of the expenses that divest other manufactures of their greatest profit, and the product is the quickest got to market of anything that man produces. Such is the business and industry of gold mining. Of what other human industry can so much be truthfully said!

A Labor Famine.

The problem of obtaining a sufficient supply of cheap labor to operate the mines of the Rand in South Africa still remains unsolved. Colonial Secretary Chamberlain the past week received a committee of prominent mine managers and has agreed to throw open Nyassaland and British East Africa for the purpose of recruiting natives, and made a further proposition that the Government import 5000 laborers, on condition that the mines import an equal number, the Government laborers to be employed on public works and in railroad construction. To this the mine operators did not give ready assent, objecting to any control of the Government in the matter. Just how native laborers are to be obtained in those sections of Africa to be thrown open as a possible market has not been determined, though it has been suggested that the natives be impressed for stated terms of comparatively short duration—a species of slavery, in fact, though the laborers so obtained were to be paid as though they served voluntarily.

The labor question has always been a serious one on the Rand, even prior to the war. It was then difficult to secure the services of native laborers who were willing to remain for a length of time which would make it profitable to educate them in mining practice and methods to a point where their services would be of value.

While undoubtedly the vast population of central Africa is able to supply the required number of men and boys, if there are unwilling workers, it would seem that it would be advantageous to employ skilled white miners, whose intelligence and skill would offset their increased pay. The African natives are said to be fairly good workers, but are efficient only in some branches of the work required. In drilling they become experts in putting in "down holes," but can not strike "uppers" to advantage, and for this reason they are largely employed in shaft sinking where it is done by hand. It is stated by those who have given the subject attention that unskilled white labor is not as satisfactory as unskilled black labor, and that the cost of moving material per ton with white labor in shaft sinking is greater than with black labor, and "the only advantage of employing white labor is in the saving of time." This statement appears to be paradoxical, as in view of the large capital invested, the "saving of time" would appear to be a very important factor in economy. The record-breaking shaft sinking in the Woluter shaft, where in November 209 feet were sunk, was all done with skilled white miners aided by unskilled white laborers. Of course, this was accomplished under unusually favorable conditions, such as are rarely found in America. Moreover, these records in shaft sinking on the Rand are made usually, if not always, under the premium system, which operates advantageously wherever tried.

CONCENTRATES.

COMPRESSED AIR installations are used with pressures up to 3000 pounds to the square inch.

A GOOD SOFT CLAY, though wet, will carry from two to three tons per square foot, without excessive settling.

A BELT will only transmit 65% as much power with an arc of contact of 90° as it will when the arc of contact is 180°.

THE Archean is the oldest geological formation recognized. It lies at a lower geological horizon than the Algonkian.

THE Bay Counties Power Co., Cal., is successfully transmitting electrical power, with a pressure of 40,000 volts, 223 miles.

COPPER CARBONATE is of two kinds: Malachite (green carbonate) and azurite (blue carbonate). It is never brown. The brown color is probably due to hydrous iron oxide, though copper may be present.

MILL TAILINGS should contain very low values before they are allowed to run to waste, otherwise a day will probably come when these useless tailings may afford profit. This is a general principle that is being constantly proven.

GREASE OR OIL of any description, whether mineral animal or vegetable, seriously interferes with amalgamation in stamp batteries or pans. It has never been demonstrated that one kind of grease or oil is less objectionable than another.

IN making blue prints a good way is to write that desired in acid-proof ink, then with a ruling pen put a blot of soda over the spot. This whitens the background and turns the ink jet black. The white spot is there to stay and the ink will not fade.

GRAY COPPER ORE (tetrahedrite) is a very complex ore and varies considerably in composition. Its most common constituents are copper, antimony and sulphur; but it also sometimes contains lead, iron, zinc and mercury, as well as gold and silver.

WHEN an engine is carrying its full load the cut-off takes place at one-quarter stroke with a free exhaust; adding three or four pounds back pressure causes the point of cut-off to be lengthened, which means that more steam is taken from the boilers.

IT is bad practice to admit cold water to a heated steam boiler. Some form of water heater should be employed to heat the water before it goes to the boiler. It will save a large percentage of fuel. In a steam plant the exhaust may be profitably employed in heating water.

TO PRODUCE a solution of zinc chloride a chloridizing roasting of the ore is an ancient expedient. And as long ago as 1844, Henderson patented a process wherein after precipitation of the copper by means of metallic iron, to throw down the zinc, together with some of the iron by means of milk of lime.

HYDROGEN DIOXIDE will remove powder stains from the face. First wash the face thoroughly, then keep it covered with pieces of lint saturated with glycerine one part and hydrogen dioxide three parts. In two to three days all the small particles and stains are thus removed, and the black marks healed clean.

A NEW COMBINATION of old elements, in which an old result is got in an easier or cheaper way, is susceptible of protection by a patent. The fact that a patented device or combination has displaced another which had formerly done the same thing or served the same purpose is evidence that it involves invention.

WHERE a vein passes out of the side line of a claim on its strike the extralateral right ceases at the point of such crossing, but the extension of the vein may be secured by a separate location along that portion of the vein passing out of the side line of the prior location, provided the land is not claimed by another.

A COLD CHISEL which repeatedly breaks when chipping hard metal will be found to be much improved if the temper be drawn to a medium straw color, polished, reheated and drawn again to medium straw color—this to be done three times before using. The tool will be found to have the desired hardness and will not break.

CARBON brushes are considered preferable to those made of copper gauze, though a well-designed dynamo or motor will run sparklessly whichever type of brush is used. The chief drawback against their general adoption is their low current-carrying capacity, it being possible to run copper gauze brushes at four times the current density that is advisable with carbon brushes.

NO ALUMINUM alloy containing more zinc than alu-

minum has any particularly valuable mechanical properties. An alloy of two parts aluminum and one part zinc, however, is superior in many respects. It has a tensile strength of about twenty tons per square inch, does not readily oxidize, melts at 425° C. and takes a high finish. It shrinks about 17% when in the process of alloying.

TO "DENOUNCE" a claim in Mexico is similar to "locate" in the United States. In the Mexican mining code "denounce" implies the taking legal possession of a particular portion of any vein, worked or unworked, known or unknown, which a miner chooses for his operations. There is no limit to the number of "denouncements" any person may make, and, as "locating" in the United States, this privilege is abused in Mexico.

THERE is nothing in the Revised Statutes of the United States which prohibits one from making a location of a mining claim by an agent. As the title comes from appropriation made in accordance with the law, it is not necessary that the person in whose name the location is made should be present. A person may locate a claim in the interest of several, and may have the claim recorded in the name of himself and the others not present. When a location is made by one in the name of others, the persons in whose interest the claim is made become vested with the legal title to the claim, and the estate so acquired cannot be divested by making a second location of the same ground, leaving out the names of the original locators, so long as the first location remains valid.

AN engineer should be a good buyer and entirely free from prejudice and open at all times to conviction; he should be ready to improve on his present methods and ought to be in a position to weigh well the two things that make coal, oil and supplies cheap, and of good value. Prices and value have to be considered, and where the two together show a decided improvement upon his present buying he ought not to hesitate in making a change, preference being given to old friends, but only when the market value and quality of goods are the same. Sentiment cannot, from a business point of view and his duty to his employer, be allowed to enter into the calculation of actual value. There is one way in which the engineer in buying supplies can keep up to date and well posted, and that is by reading carefully the announcements of our advertisers.

THE Mexican mining law recognizes two classes of minerals. The first class includes all such mineral substances as may be exploited without obtaining a concession from the Government. The second includes those which may be worked without concession. In the first class are gold, silver, copper, platinum, mercury, lead, tin (excepting placer tin), zinc, antimony, nickel, cobalt, manganese, bismuth, arsenic and iron (except bog ore, alluvial ore and ochres for coloring materials), whether all of these substances are found native or as ores in combination with other minerals. It also includes precious stones, rock salt and sulphur. Those minerals which may be mined without concession are mineral oils and mineral waters; country rock, as granite, marble, sandstone, etc., which is to be used either for itself or as raw material for ornamentation or construction; all soils, as clay, sand, etc.

GRANITE is often referred to as a primitive rock, when in fact most granites are intrusive and of relatively recent age. The granodiorites of California were evidently intruded later than the Jurassic, if the contact phenomena observable at many places can be considered a reliable index of geological age. The primitive rock is difficult to find, as the oldest rocks—the Archean—are largely fragmental, representing the accumulation of debris from the degradation of a still older terrane. The Archean formations are determined on lithological grounds, as they contain no fossils. Typical exposures are found in Canada. They are divided into two series, Laurentian, the older, and Huronian, the younger series. The distinction between Algonkian and Archean rocks is not clearly defined, though the former is recognized as a probably distinct division. This distinction in some cases is based upon real or assumed non-conformability.

THE terms conglomerate, agglomerate and breccia have distinct and different meaning. Conglomerate refers to a rock mass composed of rounded, water-worn pebbles, cobbles and sand, deposited usually under water, either on a shore line or in the bed of a river. Conglomerates are usually cemented by silica, lime, iron or some other mineral, forming a compact mass. This kind of rock is also called pudding stone. Agglomerate has reference to an unstratified mass of volcanic material, angular or water-worn, cemented by finer volcanic debris. Breccia is a rock made up of angular fragments, differing only in this respect from conglomerate. It may be composed of any kind of rock, or of many kinds. Amygdaloid has no relation to rocks of the kinds above mentioned, and is not a fragmental rock, but a volcanic rock in which air has formed spheroidal cavities. These are often found drawn out into almond shape by a stretching process, due to movement in the lava when cooling. These air vesicles are often found filled with calcite, quartz or zeolites.

SWELLING ground is not confined to slates alone. Some igneous rocks swell upon exposure in mine work-

ings. Experience has shown that the best way to keep drifts and other mine workings open in swelling ground is to timber heavily, spreading the legs of the sets widely at the bottom, and to "lag open" in order that the swelling ground may find an easy passage through the spaces between the lagging. This method also admits of cutting away and removing the encroaching ground, thereby preserving the main members of the set in their proper position. It has been found that almost every attempt to close lag ground of this character has resulted in bending and breaking the lagging and in forcing the legs of the set out of place—often breaking or crushing the timbers. Large timbers offer little additional resistance over small ones in swelling ground. The bottoms of levels have frequently to be cut down when in ground of this character. Swelling ground is one of the greatest sources of expense in mines on the central gold belt of California, though in some of them it is unknown.

REPLYING to a question from Silverton, Colo.: Where a millsite A has been subsequently encroached upon by the lode location B, and patent issued to B, unless it was expressly stipulated in the patent that the triangular section a b c was excepted, the locator loses that portion of his millsite. As long as A remains unpatented the tract really belongs to the public domain, though held under possessory title by the locator, and it is the opinion of prominent legal authority that the discovery of mineral on a millsite, by accident or otherwise, would make A subject to location as a lode claim, or be included within such. The statutes are not very explicit as to millsites and there are no precedents in a case such as that submitted. The law, however, does not permit one to enter upon the premises of another (as a millsite) for the purpose of discovery or location, but should the discovery be made outside the limits of the millsite and a claim located covering said site, it is believed the courts would sustain the lode claimant. In grading on a millsite or lode claim for the owner, the discovery of mineral by the workmen does not entitle them to the vein or deposit discovered, it belonging to the owner.

SALINE lands upon which there are salt springs, and deposits of rock salt are not subject to entry under the mining laws. The policy of the Government since the acquisition of the Northwest Territory and the inauguration of the federal land system has been to reserve saline and salt springs from sale. The object of this reservation was to preserve them for the future States, and they have never been disposed of, excepting under specific acts of Congress. By an act of January 12, 1877, some of the States upon their admission to the Union received grants of certain quantities of saline lands, to be selected within a stipulated time. The act provides for their sale at public auction at the rate of \$1.25 per acre, or at private sale at the same minimum rate in the event sales are not effected at public auction, but the operation of the act is confined to States which have had grants of salines which have been fully satisfied, or under which the right of selection has expired by limitation of time. The act, therefore, does not apply to the Territories; nor does it apply to Mississippi, Louisiana, California, Nevada, North and South Dakota, Montana, Washington, Idaho, Utah or Wyoming, none of which have received such a grant of land. Saline lands cannot be located under the desert land act. Tracts of land returned by the surveyor-general as saline may be shown to be agricultural in character, and will then be subject to entry under the agricultural land laws.

THE pumping system outlined by the Wallace, Idaho, correspondent is practically that in successful operation by application of a pneumatic principle at Cambria, Wyo., where the Cambria Mining Co. lifts a column of water 1850 feet in one straight lift. At a depth of 2300 feet a well or shaft, sunk to secure increase of water supply and for prospecting purposes, struck a stratum of water that rose within 200 feet of the surface. Two thousand feet of inch pipe were procured, the larger casing in the well replaced by a 4½-inch casing. The inch pipe, after connecting with the high pressure compressor, used in the haulage system underground, enters a T-joint at the top of the well, flowing down inside the casing 1700 feet from the surface, this air line being reduced near the bottom to ½ inch, lower and turned upward and drawn out to a ½-inch opening, forming a nozzle through which the compressed air enters entrance under average pressure of 900 pounds from the compressor. When the air was turned on there was a column of water from the 1700 up to the 200-foot level, and it took about fifteen minutes for enough pressure to gather in the empty air line and at the bottom of the well to start this column of water in motion. The back pressure at this point on each square inch was equal to the weight of a column of water 1 inch in diameter and 1500 feet in height, or 645 pounds per square inch. The air pressure at 900 pounds is about twice the back pressure of the weight of the water, so that when once in motion it rapidly raises the 1700 feet in the well and the 150 additional feet to the reservoir on the hillside at a rate of 1000 gallons per minute, which is not steadily maintained because the well can not supply more water at the same rate. After the first rush of water the well flows intermittently—first a short column of water, then a discharge of air. The rapidity of the flow is regulated by the size of the opening admitting the air. Two orifices are used—one ½ inch, which gives a flow of 120 gallons per minute, another ¾ inch, which raises the discharge to 200 gallons.

Some Data Requisite for Mining Reports.

Written for the MINING AND SCIENTIFIC PRESS by
W. L. WATTS, E. M., Los Angeles, Cal.

Many people think it is an easy thing to find a good mine, and many are willing to risk their money on the report of some one "who is supposed to know," who has just looked at a mine, taken a few specimens therefrom and had them assayed. It is astonishing that people will accept very meager evidence concerning mines and invest thereon, and yet they carefully study and weigh every fact before investing in any other enterprise. The general result of credulity in mining ventures is failure, and this hurts the mining industry.

The first thing to be considered about a mining proposition is: Is it a mine or a prospect? If it is a mine, is it one from which ore can be profitably extracted? If not, all suggestions as to its being made to pay by farther development should be very carefully scrutinized. If it is a prospect, it must be borne in mind that its value is prospective, and that such value is very much less than that of a mine in which the dimensions of a remunerative ore body have been ascertained. As far as circumstances will permit, a report on a mine should cover the following points: The topographical and geological features of the mine and the district in which it is situated, and the character of the mineral deposit, both with regard to its structure and composition. The report should be accompanied by maps, cross-sections and photographs, showing the dimensions of the property, the topography, workings above and under ground, the structure, and the known and probable extent of the ore body. Average samples of the ore body and of the different materials composing the ore body should be taken in a sufficient number of places and carefully assayed. If the ore is free-milling, the relative value of the free gold and sulphurets should be given. In the case of other ores, there should be an analysis showing the composition of the ore, and the metallurgical process most suitable for treating it should be designated. In the case of smelting ores the question of fluxes must also be dealt with, and not only the analyses of the ores, but also of available deposits of limestone and iron, must be given. The cost of labor, fuel and transportation, the supply of water and timber and the climatic conditions must be gone into. Moreover, the probable output of ore and the cost of mining and treating the same must be set forth. Lastly, the history of the mine and the title should be carefully considered, and the record of mines should receive attention which are situated on the same lead as the mine under investigation, or nearby, and in a similar formation to the mine reported on. In cases where the limited amount of development entitles a proposition to be classed only as a prospect, as many as possible of the points mentioned should be dealt with and especial regard should be paid to geological details. It is often expedient to make a preliminary reconnaissance of a mining property before examining it in detail; but it is unwise to invest in a mine without an extensive examination of the same, and, if practicable, having a mill test made on a large quantity of the ore. In the case of placer mines, a contour map of the territory should be made and the probable course of the channel or channels should be delineated. Wells should be sunk to bedrock, and sufficiently close together to demonstrate the general character of the gravel. Most of the wells may be drilled; but some of them must be dug, in order that the character of the bedrock may be ascertained. The material taken from the wells should be carefully washed, each sample speaking for 3 feet in depth; all changes in the character of the material should be carefully noted, and different materials should be washed separately. Results should be given in values per cubic yard; the available water supply at different seasons of the year; the heads that can be obtained; full information concerning dumpage, existing ditches and flumes, and the possibility and cost of making others should be clearly set forth.

With regard to oil lands, the main questions are: 1. Is there a known oil-yielding stratum that is likely to form an "oil line" through the territory to be examined; if not, is there a probability that such an oil-yielding stratum will be discovered by drilling? 2. What are the topographical conditions bearing on the conveyance of the oil by pipe line? 3. What is the character of the oil? The first of these questions can not be answered without a competent knowledge of the geology of the territory to be examined, and a report thereon should be accompanied by a map and cross-sections, showing the relative position and the structure of the geological formations, as far as the rock exposures furnish the requisite data. If there is a known oil-yielding stratum, its course through the territory investigated, and the probable width of the oil line it is likely to form, should be delineated. The best location for wells should be shown and the depth to which it is advisable to sink them should be stated. When practicable, the character of the oil should be de-

scribed, and the gravity of the crude oil and the products obtained by its fractional distillation should be set forth. If it is a question as to whether or not there is a probability of an oil-yielding stratum being discovered by drilling, it might be necessary to examine a large area around the territory immediately under investigation, and to make a reconnaissance map of the same before any conclusions of value could be arrived at as to whether or not it was likely an oil-yielding stratum would be discovered by drilling in the territory reported on. If the opinion is in the affirmative, the points at which it is considered advisable to drill prospect wells should be shown on the reconnaissance map and the areas that such wells would test should be delineated.

In all reports definite reasons should be given for any opinion expressed. It is evident that, although the element of risk is inseparable from all mining enterprises, it is greatly diminished by competent and careful preliminary work.

Mill of the Melones Mining Co. at Melones, Calaveras County, Cal.*

Written for the MINING AND SCIENTIFIC PRESS by
WALTER W. BRADLEY.

The most prominent addition to the milling facilities of Calaveras Co., Cal., during 1902 was the completion of sixty stamps in the mill of the Melones M. Co. The plans call for 120 stamps, of which the west half have been in operation since April 1st, 1902. The mill is on the north bank of the Stanislaus, at the point where Coyote creek comes into the main river, at Robinson's Ferry.

Water for power is obtained from the Stanislaus and brought from the dam 4 miles above the mill in a flume, 8 feet wide and 4 feet deep, having a capacity of 5000 miner's inches. From the end of the flume the water is carried under the mill in a 6-foot redwood stave pipe, 726.45 feet in length. Fig. 1 shows a section of this pipe, and gives a comparative idea of its size, arrangement of the staves, spacing of the hands, and the saddles for supporting it. A tunnel, 11'x11' in the clear, is driven from the edge of the river, 313.15 feet, to a point directly under the center of the mill. It is timbered with 16-inch square timbers, the sets being 5 feet apart. The water pipe is supported from the caps in "U" hangers. The water discharges along the floor of this tunnel. In a chamber at the bottom of the vertical shaft connecting this tunnel with the mill is a 27-inch Victor turbine wheel which transforms the energy of the water (under a 58-foot head) into effective power. The power is carried up into the mill by a vertical shaft, 40 feet 3 inches from top of wheel casing, and changed to the horizontal shaft by the bevelled gearing seen in Fig. 2. The teeth in the gear on the horizontal shaft are hard maple. The vertical pipe showing on the left of the picture contains a standpipe, inside, which is connected into the water pipe in the tunnel below, acting as a safety valve in case of sudden shutting down of the gate in the turbine. The standpipe also serves to indicate the water level in the penstock. The wide faced pulley on the farther side of the bevel gear is belted to the main line shaft running the west sixty stamps; and the one on this side is to drive the east sixty, but is at present belted to a countershaft driving the pumps, and a 150-light dynamo for lighting the mill and office buildings. The outside pulley on the west end of the jack-shaft drives an Ingersoll-Sergeant, five-drill compressor located on a level with the vanner floor below. The pulley in the foreground drives a 135 H. P., 250 volt, multipolar generator, which furnishes power for the electric railroad in the main tunnel. Both of these outside pulleys are connected with the central portion of the shaft by friction clutches. Since the photograph (Fig. 2) was taken, another pulley has been keyed onto the end of the shaft in the left foreground, to drive a double acting, duplex, Giant compressor—the smaller compressor proving inadequate to meet demands of machine drills. The air is carried to the mine from the mill through a mile of 6-inch pipe, up over Carson hill to the top of the Reserve shaft. A branch line is also laid in the main tunnel to the breast on that level. The rock broken in the upper levels is dropped through a chute to a bin on the South Carolina tunnel level; there trammed in 1½-ton cars, six cars in train pulled by a horse for 550 feet underground; dropped 220 feet, vertical, to a bin on the Melones (main tunnel, or 1000-foot level); then trammed out 4700 feet in four 8-ton cars in train by electric locomotive to the outside storage bin above the mill. From here the rock is trammed 150 feet to the mill and dumped into the rock breaker, and distributed to the mill ore bin below by car. There are two No. 5 Gates rock breakers set side by side. These may be used together or singly, the grizzlies being arranged to send half of the rock to each breaker when required.

Fig. 3 shows the cam shaft floor looking toward

*See Illustrations on Front Page.

the center of the mill. In the background, at the end of the ore bin, can be seen the top of the 30,000-gallon water tank for batteries and concentrators. The Canda self-locking cams are used. The order of drop is 1—5—2—4—3. The guides for the stamp stems have wood bushings of seasoned maple in iron frames. With the horizontal geared power shaft running 198 revolutions per minute, the stamps have a speed of 106 drops per minute. Prior to November 1, a considerable portion of the rock handled was the oxidized ore from an open cut at the top of the hill. Starting with a 7-inch drop, 108 drops per minute, a 6-inch discharge (chuck block being used), and 24-mesh iron wire screen, trouble was experienced with the mortars filling up by the screens becoming clogged with splinters from the roots, chips and hits of wood accompanying the ore. There was often a very bothersome amount of roots in this surface ore. Then the chuck blocks were discarded, the drop lowered to 5½ inches and the speed to 104 drops. By taking out the chuck block the height of discharge varied from ½ inch to 3 or 4 inches, as the dies wore down. When the dies became that low an extra set of false dies was put in and used till the regular dies were worn out. This low discharge prevented the chips collecting and floating on the surface of the water and so clogging the screen, and kept them so well agitated that they were thoroughly pulped and passed through the screen readily. The mortars in this mill are the narrow type known as the "Utica fast crushing mortar," with liners. An average of four to five tons of ore per stamp are crushed daily. The ore feeders are of the Challenge type. The arrangement of the plates is shown in Fig. 4. They are divided plates, 25 feet long, and have an inch step half way down. Originally they were set at a grade of 2½ inches per foot; but, after running a while, the grade was changed to 1½ inch per foot by blocking up the lower end, as they were considered too steep for the character of ore being handled. The engraving shows the plates of the middle twenty stamps not yet raised. Hanging from the timbers overhead immediately in front of the battery posts will be seen a steel rail. On this rail runs a hanging platform for transporting battery cleanup sands and broken shoes and dies to the cleanup room at the west end of the mill. In the cleanup room, besides sinks, bench for repairing screens, rack for screen frames and chuck blocks, etc., are two cleanup harrels and a three-hall amalgam grinder for cleaning the amalgam.

As intermediates, between the main line shaft and the lines driving the concentrators, are two pairs of cone pulleys, one for the tables and one for the belt machines. These cones are 7 feet long, 24 inches diameter at large end, 20 inches at small end, and by them the speed of the concentrators may be varied as conditions demand (i. e., change in speed of motor or changes in character of pulp). The stamps, the tables and the Frues have their separate speed indicators. The floor on which the tables are located is between the silvered plates and the vanners. There are twelve of these machines (one for each five stamps), nine Wilfleys (seven with the elevator and two without), two Hallett stratification tables and one Woodbury improved. Fig. 5 shows two of these tables, the one nearest having the elevator attached. The tailings from the tables are run over the Frues, one-half over each of two. Because of this it was found necessary to use the clear water on the tables sparingly, as otherwise the belt machines would have more water than they could handle and do good work. The Wilfley and the Hallett tables require a speed of at least 240 revolutions per minute to give a reasonable degree of separation of the sulphides from the rest of the pulp. By running them at 250 or 260 revolutions the grade can be flattened, less clear water used and a better separation obtained. With this arrangement it was found very convenient to put on the lower corner of the table, about on the line of separation between the sulphides and the other materials, a pivoted redwood "pointer." By this the amount of "sand" allowed in the concentrates could be changed slightly without altering the grade of the table or the water supply. The Woodbury table requires 20 to 25 revolutions per minute more speed than the others. The tables catch the major portion of the sulphides, and what fines escape them are caught on the belt machines below (Fig. 6). These are of the Frue style, 4 feet wide, and are run at 200 revolutions per minute (180 being the minimum at which they will do reasonable work). The tailings are run into the river at the mouth of the mill tunnel, where there is an automatic sampler. The raw concentrates are treated by agitation cyanide process direct.

No SELF-CONTAINED furnaces for treating cinnabar ores, having a capacity of twenty to thirty tons daily, are made, excepting the well-known type of brick furnace in use in California. Retorts are manufactured of iron for the purpose of retorting amalgam, and in these ores of quicksilver may be treated, but nothing except high-grade ores could be handled profitably in these retorts, as their capacity is limited and they are rapidly destructible. What is known as the continuous-feed furnace, which is the only economical furnace made, is built of brick.

Stamp Milling and Amalgamation of Free Gold Ores.

NUMBER 11.

Written for the MINING AND SCIENTIFIC PRESS by DANA HARMON, San Francisco, Cal.

WOODEN MORTAR BLOCKS.—If wooden mortar blocks are used, make them long—12 to 14 feet—set on solid foundation. Ram with concrete on sides and ends of pit. This concrete should not be continuous all around the block. There should be an open space about 16 inches long on each side (but not on the ends) leading to the bottom of the pit; these spaces to be filled with dry sand, or tailings run in. There is no better preservative to wooden blocks than constant wetting, and these sand pillars insure thorough saturation of the wood.

By no means is it a sine qua non that the natural foundation be solid rock. If a hard rock bottom does not exist at the site, then thick concrete, with plenty of base area, must be provided. With a spongy bottom you will be safer by first driving piles for the concrete base to rest upon. Even with a natural hard rock floor in the bottom of the pit, there should be a layer of concrete 10 to 12 inches thick, for the reason that natural rock floors almost invariably have weak spots—they lack the essential quality of homogeneity. Make this floor concrete in two batches—first the ordinary mixture of sand, cement and rock; next a couple of inches of sand and cement to bring the floor to a level.

Now prepare a frame of 1x4 battens the exact size of the base of the mortar block. Set the edges of the frame on a bevel and chamfer the base of the block to exactly fit the concrete cap formed by this frame. Wedge this frame securely on the floor of the pit and then fill in around the edges of the frame and flush with its top with cement mortar. When this has well set remove the frame and you will have a smooth concrete cup to receive the mortar block. Into this cup sprinkle a hedding 1 inch thick of clean, sharp, sifted, fine sand. The advantages of this cup are obvious. Its bevel edges guide the block exactly to its true position. Dirt tamping is had; concrete is the best, and next to that tailings run in.

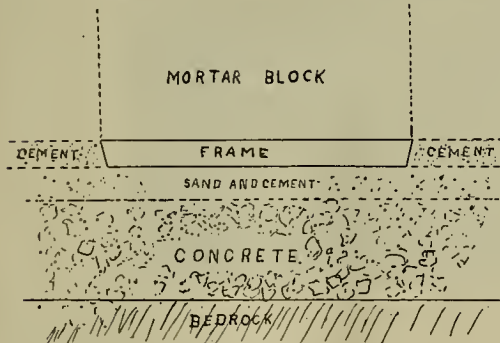


FIG 1.

The wood must be sound, solid and free from sap and wind shake. If bowed by band or sawed at a mill, examine the log before dressing. On the Pacific coast, yellow pine full of pitch, or heart sugar pine, or hard Mendocino redwood make excellent blocks. If a solid block is used, i. e., two blocks bolted and keyed together, the two halves should both be butt cuts, so as to secure homogeneous setting. The question is can we at reasonable expense preserve the outside of the block from rot, for it is the outside that holds the mortar bolts. Tar is not good. Creosote seems to be out of the race because it must be forced into the pores by pressure. Even then, the depth to which it will penetrate depends upon the hardness of the wood; even in some pine woods it can not be forced to the center of a 4-inch plank. The method narrows to the slacked lime treatment, or to painting with some such hot preparation as paraffine, or avenarius carbolineum. The paraffine can not be used on mortice and tenon joints because it is too viscid and sets too quick. Carbolineum is readily absorbed and is excellent for such joints. It will not add much to the expense to dig a pit and dip all the foundation timbers. Three men will handle a mortar block with a hydraulic jack. A bot dip is so superior to hand painting that it is worth its increased cost. Mortar bolts are usually about 30 inches long; they should be longer, say 42 inches.

A first-class mortar block can be built up of plank 2 to 3 inches thick, well saturated with paraffine or carbolineum, nailed and bolted together.

Mr. V. S. Garharini, a well-known millwright of California, uses the following ingenious method of lowering the mortar block into the pit. It avoids the use of a high gin pole or tripod, and delivers the block squarely into the pit. He fully dresses the block before lowering it, pockets, top, bottom and sides. The bottom of the pit is carefully

prepared and the blocks drop into the exact spot. The battery frame and ore bin timbers are first set up. The block is then rolled into position in front of the pit, tipped up to 45° angle by a hydraulic jack, and then brought vertical between the posts by a light tackle block; a 12x12-inch is thrown across the top of the battery posts to carry on chain blocks the weight of the block while the lagging is being uncovered from the pit; the line sills are now keyed tight against the block, which is then quickly lowered by easing off on the line sill keys; the block slides into place gently, being held by skin friction against the sills. The method is a great improvement over the old gin pole style, wobbling a block awkwardly into the pit and finally landing it in that exasperating spot almost but not exactly where you want it, with two or three loose pebbles underneath.

GUIDES.—Use the individual iron guide—guides without the wood bushing.

The stem will not be excessively worn by rubbing directly against the cast-iron guide with $\frac{1}{16}$ of an inch play on either side. Oil sparingly, by just touching the stem with waste moistened with a good quality of machine oil.

There are iron guides with wood bushings; but I have never seen one worth buying. The cap piece should be made of malleable iron and not of cast iron, and the bedpiece should be 2 inches thick to avoid breakage.

The cap bolts should not go clear through the girt, but should be arranged so that they can be readily replaced. Breakage of bolts is unavoidable, therefore renewals must be promptly made.

Competition brings the foundryman to manufactur-

WARMTH OF BUILDING.—The plate and concentrator rooms should be built so as to be warm in winter season. Never have a draughty mill. Icicles kill plate amalgamation. A few dollars spent in tarred paper on the walls will be a wise investment in cold countries. A generous stove set on the bottom floor with 11-inch smokestack and a couple of bot air drums 10 feet long by 30 inches in diameter will prove economical of wood and keep a 20-stamp mill building comfortable and fit for amalgamation. Lay a few 2-inch bot water pipes on the floor underneath the tables to keep the boards dry in winter season.

Light and warmth are not luxuries; they are necessities of the business.

TABLES.—Tables should be heavy and solid. Flimsy tables made of thin boards and light scantling get out of true. Figs. 2 and 3 show a table fastened to the floor which by my notion has advantages over the rolling table. Twelve feet long by 10 feet wide will suffice; 10 feet of this is nailed to the floor; the 30-inch apron is removable to allow setting in shoes and dies.

The frame is of three pieces, 4x6 inches by 10 feet, dressed on upper edge and notched down $\frac{1}{2}$ inch every 2 feet. The boards are $1\frac{1}{2}$ inch thick, 2 feet wide, 5 feet long, dressed on upper side, edges and ends. After dressing true, cross plane the board so that there shall be a fall of $\frac{1}{16}$ inch from ends to center. Each board is butted snug to the one next above it, and nailed or screwed to the 4x6-inch, the ends of the boards being flush with the outer edge of the outside 4x6-inch. The side rail is a plank $1\frac{1}{2}$ x10 inches nailed against the side of the 4x6-inch and

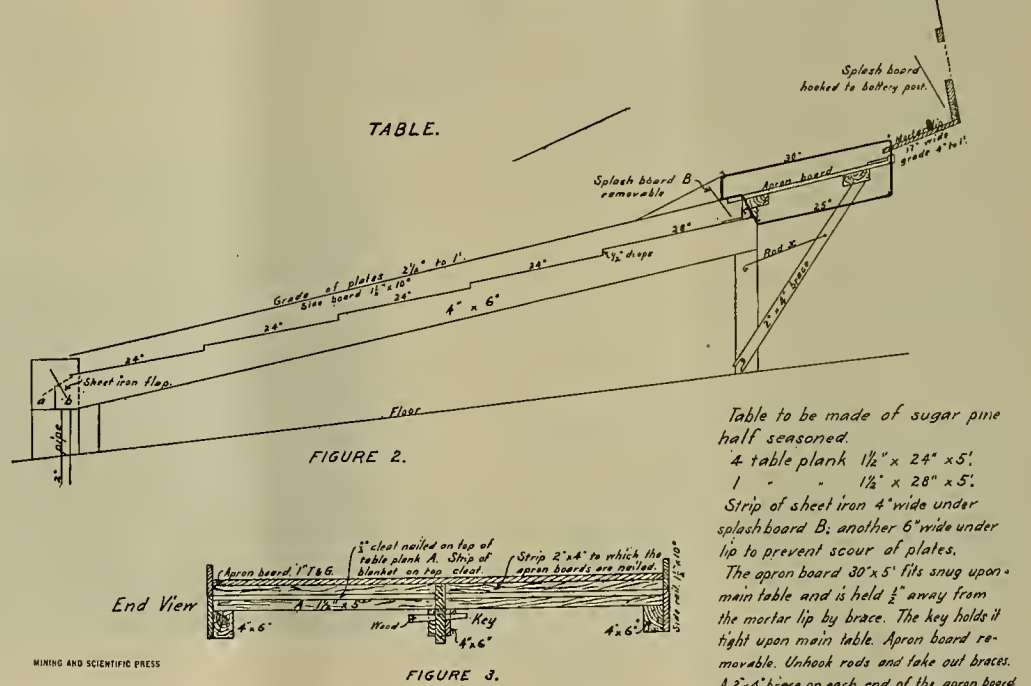


FIGURE 2.

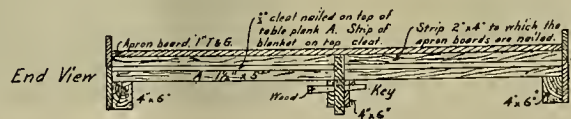


FIGURE 3.

Table to be made of sugar pine half seasoned.

4 table plank $1\frac{1}{2}$ " x 24" x 5'.

1 " " $1\frac{1}{2}$ " x 28" x 5'.

Strip of sheet iron 4" wide under splashboard B; another 6" wide under lip to prevent scour of plates.

The apron board 30" x 5' fits snug upon main table and is held $\frac{1}{2}$ " away from the mortar lip by brace. The key holds it tight upon main table. Apron board removable. Unhook rods and take out braces.

A 2"x4" brace on each end of the apron board

ing a cheap iron guide—the very lightest salable—but the buyer had better pay for more cast iron and for malleable caps.

With the old-fashioned oak guides there is too much friction, too much wear from burning—in a few months the shoe won't center on the die; too much loss of time when turning stems.

With the individual iron guide the stems will keep cool. With the oak guide the stems are always warm and often hot. Heat means friction.

SCREENS.—Before deciding upon any screen try a variety. I prefer the tin costing $\frac{1}{4}$ cent per ton crushed, the hurr inside. Neither Russia iron, brass wire nor steel can compete with this. Put strips of $\frac{3}{4}$ -inch wide of $\frac{1}{2}$ cheap rubber sheet packing between the tin and the wood frame and you will at least double the life of the tin screen. Before using, burn off the tin over a clear forge fire—just heat to redness, keeping the screen moving to and fro over the fire—this anneals and toughens the iron. I would emphasize the importance of this.

The three commercial sizes are: No. 0 = No. 8 needle; 441 holes to square inch. No. 1 = No. 7 needle; 324 holes to square inch. No. 2 = No. 4 needle; 225 holes to square inch.

No. 3 is too coarse for quartz.

If manufacturers would punch a size between the No. 0 and No. 1 and also a size a trifle coarser than No. 2, the range of tin screens would cover nearly all cases of quartz milling. The screen should have a selvage finish at both ends. It will be found that the perforations in a narrow screen (selvage both ends) will be more uniformly spaced than in the large sheets. Unless watched, the manufacturers will ship a box of 10x14-inch cut from large sheets—rarely a selvage edge.

LINERS.—Mortar liners removable at cleanup. The main hack liner instead of being in one piece should be cut so as to give a lower piece of same width as the front liner.

forming a tight joint against the ends of the boards. To prevent leaking, bruise the edges of the boards with a blunt chisel, the blade 2 or 3 inches wide and $\frac{1}{4}$ inch thick. As soon as the table is wet these bruises swell. A $\frac{1}{2}$ x1-inch strip holds the coppers down and completes the tight joint.

At foot of table a double drain box with sheet iron flap. While the mill is running the pulp flows into box (b), thence to concentrators through a 2-inch pipe, the end of the pipe projecting $\frac{1}{2}$ inch above the bottom of the box (b)—thus forming sufficient quicksilver trap. When brushing up, the flap is lowered and the washings go over into box (a), whence they overflow through notches into box (b).

These double drain boxes will, under careful milling, recover \$25 to \$50 per month in amalgam which would otherwise be swamped in the concentrates or lost in the canyon. Under slipshod milling this box catchment might easily pay the mill payroll. This is for twenty stamps.

Fig. 2 shows the splashboard arrangement. By using a lip plate 17 inches wide, set on grade of 4 inches to the foot, there will be no clogging with sand and sulphurets, and its amalgam catchment will be heavy. Foundries will ordinarily cast a mortar with $1\frac{1}{2}$ inch to foot grade on the lip. This will surely clog and prevent the amalgam from catching on the lip plate.

Let the pulp drop from the mortar lip (usually $1\frac{1}{2}$ to 3-inch drop) upon a sheet iron strip 6 inches wide, whence it flows upon the copper plate. A drop of over $\frac{1}{2}$ inch will scour the silver. Under the splashboard B is 4-inch strip of sheet iron over the plate to prevent scour. A plain 3-inch wide splashboard receives the pulp from the 17-inch lip and prevents too rapid rush upon the apron plate.

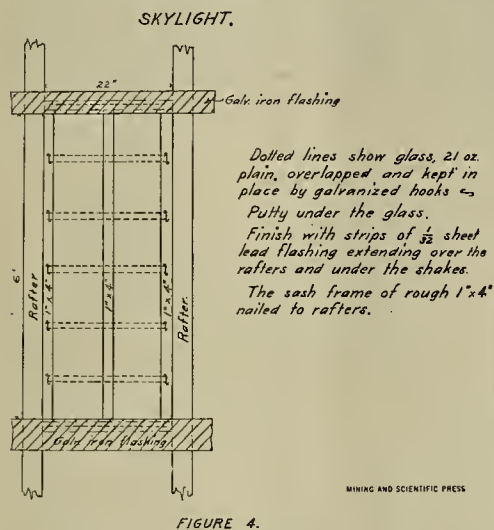
There is no objection to using a quicksilver trap at the end of the tables, except this, that the millman will be apt to lean too hard on the trap. If any trap is used the type in use at the Black Hills mills is per-

haps the best, 8 inches wide by 10 inches long, with three sliding iron partitions inside, 18 inches deep on inlet side and 6 inches deep on outlet side.

LAUNDERS.—The V-shaped wooden launder has the advantage over 2-inch pipe of not clogging. Set on grade of $1\frac{1}{2}$ inch per foot. Make the box 1x4 sides set on top of 1x6 bottom, then nail strips inside to form the V.

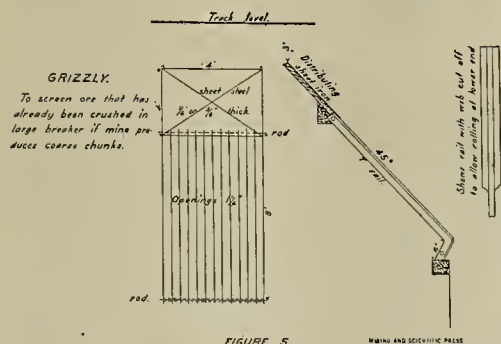
ROCK BREAKERS.—Upon nearly all quartz or hard ores the mill should have two rock breakers, coarse and fine. Set the jaws of the coarse breaker 4 inches apart, so that a sledge can slide through, thereby avoiding the breaking of the pitman or side rods. Dump all the ore, coarse and fine, going to the mill, directly into this large breaker. The mixing of fine with coarse prolongs the life of the jaws. All the ore that is crushed in the large breaker goes to a grizzly—the fines going to the feeders, the coarse to be crushed in a second breaker. Manganese is the most durable material for mortar liners and rock breaker jaws.

GRIZZLY.—Grizzlies often give much trouble by clogging—the rock begins to build against the timbers. The most satisfactory that I have ever used is made of twelve or sixteen-pound T rail, downside up, bars 6 to 8 feet long, $1\frac{1}{2}$ inch apart, at an angle of 42° to 45° , the lower end of the rails rolled over, thus:



(See Fig. 5.) If not over 8 feet long, it will be unnecessary to use a middle bar with its thimbles. The steep grade will give a fine product—there will be only occasional clogging.

SKYLIGHTS.—Nearly every large mill is dark in the middle; none need or should be. Builders depend too much upon side wall windows. One skylight in



the roof is better than four side wall windows. Fig. 4 shows a cheap skylight set flush with the shakes which I have used successfully even in heavy snow countries on half pitch roofs. The glass was ordinary twenty-one-ounce plain. It does not leak and the snow slides over it. Whitewash walls and ceiling. Have a well lighted mill day and night.

(TO BE CONTINUED.)

THERE is always more or less friction in moving mine cars, particularly underground where the increased friction and resistance is due to dirt on the rails. It will be found that the resistance on properly constructed tracks, those having uniformity of gauge and carefully tamped, offer much less friction than those that alternately spread and pinch the wheels of the car or sag beneath its weight, requiring the trammer to constantly push the car up-grade. It is economy to lay good tracks with a grade suited to the traffic. Five inches in 100 feet is a normal grade on a straight track, but the grade on curves should be more, as the resistance is greater. The gauge should be slightly wider on curves than on the straight portion of the track. Well oiled wheels are indispensable to light-running cars.

The Terlingua Quicksilver Deposits of Texas.*

NUMBER II.—CONCLUDED.

Written by B. F. HILL, Geologist.

HANDLING THE ORE.—After being taken from the openings the ore is sorted by hand. The fine material, which is often abundant, is tested by means of washings in the horn spoon. The ore is put into piles according to richness and transported to the furnaces by means of wagons drawn by mules. The haul is often over a mile and the roads are bad. The installation of trams or cables would seem to be desirable in some of the workings.

The ore wagons discharge their loads either on the floors of the crushers or in piles from which it is taken by wheelbarrows to the crushers.

THE PLANTS.—The crushers used at both reduction works are of the Blake type of jaw crusher. They have capacities greater than the furnaces, and it is necessary to run only a few hours of the day. The crushers are operated by Fairbanks-Morse gasoline engines. The crushed material is carried by belt conveyors to the ore bins. From these bins, which are above the level of the top of the furnaces, the ore is taken through chutes into cars of a cubic yard capacity. The ore put into the furnace at the top descends and is burned. The spent ore is drawn from the base of the furnace into iron cars and dumped into the canyons.

THE RETORTS.—Although at present all the quicksilver produced in the Terlingua district is from continuous furnaces, when the field was first opened a considerable quantity of metal was produced from

years of experimental work in quicksilver reduction. The furnaces employed have been evolved with much labor and expense, and it has been possible for the Texas miners to attain good results without passing through the long and expensive experimental stages. The scarcity of water has made it necessary to cool the condensers by air entirely, and has also been prohibitive of allowing the fines to be made into "adobes."

In general, the furnace utilizes a series of inclined shelves placed in the opposite walls of narrow, vertical shafts. These shelves retard the descent of the columns of fine ore. The shelves are inclined at an angle of 45° to the walls, and each shelf is, therefore, perpendicular to the next lower one in the opposite wall.

Ore fed into the furnace from the hopper at the top runs from one shelf to the other until it reaches the bottom, when it forms a continuous zigzag column of ore from the top to the discharging apparatus. The end walls of the ore chambers are pierced with rectangular openings, allowing the flames to pass from the fireplace through the ore on the shelves to the vapor chamber, and from there they pass into the condensers. Arches over the firebox and across the vapor chambers cause the air and fumes to make four passages across the furnace before going into the condensers. The arches cause the air that enters the fireplace to be drawn through roasted ore, thus heating the air and absorbing quicksilver vapor from the ore. Then the hot products of combustion pass through the partly roasted ore, raising its temperature, and then pass back and forth through the comparatively cold ore of the upper part of the chamber. This method has the advantage of heating the cold ore and cooling the hot fumes, which when they leave the furnaces for the condensers are only slightly above the boiling point of quicksilver.

The device at the base of the ore chamber for dis-



Fig. 2—Quicksilver Retort, Terlingua, Texas.

retorts, about ten of which were operated in various parts of the district.

The largest amount of quicksilver from retorts was produced by Lindheim & Dewees, whose plant was situated on Terlingua creek, 10 miles from the mines, as it was found cheaper to haul the rich ore to the wood and water. Here several hundred flasks of quicksilver are said to have been produced, the ore consumed having been very rich cinnabar. In fact, only the rich ore can be treated by the retort method, as the waste is great. The retorts were found to be short-lived and burned out rapidly, in spite of precautions taken to prevent it.

THE FURNACES.—The furnaces used in quicksilver reduction in the Terlingua district all belong to the same class of continuous furnaces. They are slight modifications of the Scott-Huttner furnaces used extensively in California, and were built by Robert Scott.

Three furnaces have been built—one of 40-ton normal capacity, belonging to the Terlingua Mining Co., and two 10-ton furnaces, belonging to the Marfa & Mariposa Co. The latter company have the condensers arranged in battery form, allowing the last four condensers of the eight to be used by both furnaces.

The New Almaden practice of separating the ore into classes of various sizes and richness, as "tieras," "granzas" and "granzita," is not employed at Terlingua. The ore has a large proportion of fine material in it as it is mined, and the large lumps are, as a rule, crushed to about 1 to 2 inches, which would place it in a class between the "granzita" and "tieras" of California. The average of from 1% to 3% corresponds also to the value of California ore of the class mentioned.

The operators in the Terlingua field have been fortunate in having the benefits of the results of

*Extract from Report of B. F. Hill in Bulletin No. 4, University of Texas.

charging the burned ore is arranged in such a manner as to allow the same quantity of unburned ore to enter the furnace from the hopper at the top as it is drawn from the bottom. In the 40-ton furnace the ore remains in the ore chamber thirty hours.

THE CONDENSERS.—The principles upon which the most successful condensers have been constructed are as follows: 1. Cooling of the furnace fumes by contact with large radiating surfaces exposed to the air. 2. Sedimentation of the condensed quicksilver particles in enlarged chambers where the velocity of the gaseous mixture is reduced. 3. Constant exposure to friction surfaces, cross-currents, and vortex motions to remove the globules of metal by calling into play the force of adhesion.

The condensing systems of these furnaces consist of brick chambers connected to the furnace by pipes. These chambers are tall and narrow, divided into compartments having openings about 2 feet square at the top and bottom to allow cleaning. These openings are closed by iron plates held in position by wooden bars across the front, and are made tight by setting with clay and ashes. The floors of the condensers, which are carefully constructed of cement, slope each way from the center to the sides, so as to allow the condensed mercury and acid water to be delivered to the side, and to facilitate the handling of the soot. Along each side of the condensers are inclined gutters of brick, about 18 inches deep and 9 inches wide, which carry the condensed mercury and acid water to receiving vats.

The condensers are built with air spaces between them to facilitate the cooling of the fumes. No water backs are used on the Terlingua plants, the cooling being entirely due to radiation. The fumes after leaving the furnace pass into the first condenser near the top, pass down the compartment on that side, thence through an opening in the partition wall into the other compartment of the condenser, up which they pass to be discharged into the next of the series

of condensers through iron pipes. These connecting pipes have valves to regulate the draft.

The plant of the Terlingua Mining Company has all the condensers, eight in number, arranged in a straight row. The first condensers are used as a dust chamber, and little or no mercury is obtained from it on account of its high temperature. Most of the mercury is obtained from the second and third chambers, while scarcely any is obtained from the last three. Between the eighth condenser and the smoke-stack an arrangement has been devised for increasing the draft through the condensers by means of a fire, thus pulling the gases along the line of communication between the condensers.

The plant at the works of the Marfa & Mariposa Co. is arranged somewhat differently. The two condensers next to each of the two furnaces in this case yield a great proportion of the mercury, with very little after the fourth or the first in the battery used by the two furnaces in common.

PRODUCT OF CONDENSERS.—The condensers, when cleaned, yield other materials besides the quicksilver, which are to be taken into account. Ore dust is invariably present in the first condenser—in fact, this condenser at the Terlingua Mining Co.'s furnace yields little quicksilver and is used for a dust chamber. Considerable quantities of ore dust beyond the first condenser furnishes evidence that the furnace is not working properly.

The whole series of condensers have the interiors coated with soot, which covers walls, roofs and floors. This soot is due to the unburned carbon and hydrocarbons from wood used as fuel.

Large quantities of quicksilver are mechanically intermixed with soot, the greater proportion of which is removed by mechanical treatment. The percentage of quicksilver that the soot carries depends entirely on the position of the condenser with regard to the furnace. The soot contains in the cool condensers large quantities of acid water, while in the hot ones it contains little or none. In the condensers remote from the furnace the soot is intimately mixed with acid water and becomes a black slime carrying small quantities of finely divided quicksilver.

In cleaning the condensers, the iron manhole at the base of the condensers is opened and the operator removes the soot that has accumulated along the lower walls and the floor, by means of a long hoe made of square pieces of thick rubber, supported by iron plates, the handle being attached at the center. The rubber is used to prevent wear on the floors and walls. The soot is drawn down the inclined floor to the manhole and is there kneaded back and forth with the hoe. This causes the quicksilver particles to cohere and run out of the soot into the channels leading to the receiving vats. Before reaching the vats, however, the quicksilver runs through settling boxes of wood and is filtered through charcoal. From the bottom of the settling boxes it flows through a goose neck into the vats. By this means it has been freed from particles of soot and acid water and is "dry" and ready for hotting. The operations from the gutter to the vat are conducted by gravity.

When the soot at the manhole has been worked until most of the quicksilver has been removed, the residue is taken from the floor and treated outside. When the soot on the floor is too dry to readily yield up its quicksilver, water is added; when too wet, dry ashes are added. From long experience, the workmen who are in charge of the "clean-ups" have come to recognize the exact amount of water necessary for the easiest working off the soot.

After the soot has been taken from the floor of the condensers it is placed on an inclined sheet-iron box, under which a fire has been built. Here water or ashes are added from time to time, as is necessary, and practically the same operation as was used on the floor of the condenser is gone through. The quicksilver that is freed from the soot goes down to the lower end and runs into a sheet-iron bucket. The residue of the soot from this method of working is charged back into the furnace. The waste from the soot, therefore, is insignificant, as it goes through the furnace time and again.

The operation of cleaning the condensers is carried on without interrupting the working of the furnace. Only one manhole at a time is opened and the inward draught is sufficient to prevent the escape of fumes.

The State Legislature of California has legalized a code of bell signals for mines and its use is compulsory. Any accident occurring through neglect to employ the State code makes the management of such mine responsible for said accident. A miner working in a locality where the State code is in use who goes to another district of the State where the State code is not employed is in imminent danger unless he at once familiarizes himself with the code in use in the latter district.

GRANITE, by the addition of hornblende, becomes hornblende granite, and by the disappearance of mica in the presence of hornblende becomes syenite. Andesite, by the addition of quartz, becomes dacite.

CRYSTALS of red copper oxide, when incrusting, sometimes resemble crystallized cinnabar, but the former is darker in color.

The Dry Ores of Slocan, B. C.

Written for the MINING AND SCIENTIFIC PRESS by
RONALD C. CAMPBELL-JOHNSTON, M. I. M. M.

The dry ores of Slocan are undoubtedly attracting considerable attention from the mining world for many reasons; partly that her veins contain large masses of ore; partly that the average values are abnormal, and partly as this class of ore calls for a new arrangement of metallurgical skill to recover at least the requisite 90% of contents.

To the unprofessional man the question arises as to what is a dry ore? In smelting gold and silver ores, sufficient base metals, such as copper, or lead, are required to carry the precious metals and to leave a clean slag to throw away in the first stage. Lead, being the most common conveyor used, when absent in an ore, or existing in less quantities than 10%, has to be added as a wet ore. Therefore a dry ore is one carrying precious metals, but is not self-containing as a lead flux, whereas a wet ore has sufficient lead in its composition.

The characteristics of the dry ores of Slocan are that the silver occurs native, or as sulphides, or alloyed. The gold is carried in arsenides and sulphides of iron, only being native visibly sometimes in the oxidized planes.

The structure of the district consists of ranges of eruptive granite with trend northerly and southerly, indented by past and present glaciers with their accruing rivulets eating into the smooth sides. The elevations vary from 9000 to 2000 feet above sea level, with a corresponding climate in snow and ample water power. Timber grows thickly to 5000 feet and then gradually dwarfs off to barrenness. Deep, narrow and long lakes lie parallel to the trend, with rivers forming level valleys as outlets, affording cheap methods of transportation and easy grades for railways. Mono-railways driven by electricity are proposed to connect the mines with the trunk transportation systems.

The veins running north and south have various consistent strikes, some east and some west of north, the different series making clean intersections. The granite when altered and softened by lime infiltration seems more favorable for ore. There are even later veins with east and west strike which shatter the earlier north and south veins at their junctions. Dikes of pegmatite and felsite occur, but seem, so far as explored, to be later than the veins in formation, and therefore have no effect on the other fissures, except taking their place when crossing them.

Between walls the veins vary from 125 feet to a few feet in some cases. In these veins the ore shoots lie parallel, come together and form large masses; or jump off to another plane, and so necessitate continual crosscutting, or stoping out everything between walls.

The vein fillings, outside the ore shoots, so often carry commercial values distributed throughout that their mechanical treatment is an object. The dip of the north and south veins is mostly to the east, but several examples of a westerly dip occur. The dip of the east and west veins seems to have an equal number of examples to the north and to the south, but with no connection to form synclinal or anticlinal veins, their characteristic contents being dissimilar. The values of the ore shoots when sorted for sacking sometimes give phenomenal results, but there are numberless shoots of ore from 100 to 1100 feet long, 60 to 500 feet deep on their axis, and 2 to 40 feet wide, proven to carry from 60 to 300 ounces in silver per ton and \$4 to \$40 in gold. The vein fillings carry ten ounces in silver and upwards, and from \$2 in gold upwards. The shoots occur in the mines at frequent intervals near intersections of veins. Three series of parallel veins have already been proven by work and natural exposures to continue in straight courses for 5 miles and maybe go farther.

Stoping and developing costs an average of \$2 per ton mined and less on large veins; wet concentration by jigs and tables 40 cents, with a 70% extraction; sacking and sorting, with price of sacks, costs \$3 a ton on the ore sorted, or say, 75 cents on the ore mined, allowing for one-fifth waste. Transportation by teams costs \$3 a ton. Freight and treatment at smelters \$9 a ton, with five ounces deduction for silver up to 100 ounces, and ten ounces per hundred deduction on surplus values.

The per ton cost of ore mined going five into one, can be seen from the above statement, and also that only ore shoots without waste can at present be handled.

The aim of the managers is to stop out the veins from wall to wall, to mechanically treat the whole hulk in order to concentrate the values, and yet recover 90%. On the sulphides below water level jig and table concentration, followed by the Elmore oil process, is proposed. The oxides which constitute a large tonnage have then to be left untreated. Others propose to cyanide the ores in hulk after concentration. The cost of treating slimes by filter presses, or converting the sulphides into chlorides to ensure

successful solution by the Phoenix or other process, allows only the richer ores to be treated.

Dry concentration stares one in the face as the primary solution, and this is a process to treat material as fine as 80 to 200 mesh when classified, since these fines occur in all crushings.

Local facilities for fuel, fluxes and ample power are abundant. With an economical concentration the gold and silver ores of Slocan are rich enough to continue being profitably produced, despite the even lower price of silver.

Slocan, B. C., Jan. 19, 1903.

Mining Manganese in Colombia.*

G. E. G. WILLIAMS, Colon, S. A.

Manganese ore has been found upon the isthmus of Panama throughout a region of nearly 300 square miles, over the greater part of which, however, it is known only in small bodies without commercial value.

The ore occurs as oxide, chiefly the variety psilomelane.

The Soledad mine is the most important in the region.

The first discovery here was of large and small boulders of manganese ore scattered over the westerly and northerly slopes of the Soledad mountain. The boulders were all upon the surface, or at slight depths below. The surface soil was yellow clay formed from the decomposition of a shale. In shallow excavations the clay became harder, and the original lines of stratification were usually visible, although the decomposition extended to a much greater depth. The boulders of manganese were invariably contained in the decomposed surface rock, and extended investigation failed to show any ore in the lower strata.

The Soledad ores comprise braunite, pyrolusite and psilomelane—principally the last. The greater part of the ore is massive, varying in color from a steel gray to a bluish black, and usually showing a conchoidal fracture. It is rarely stratified; but there are some bodies of interstratified soft ore and clay. Pockets of ore, soft enough to be mined without explosives, are occasionally, but not often, found in the massive ore.

Besides high-grade bodies, there are large bodies of siliceous ore carrying about 47% of manganese, and from 18% to 30% of silica. These are not worked at present, but will undoubtedly be utilized hereafter, since the greater part of silica is not in chemical combination with the ore, and can be removed by crushing and jigging. The percentage of phosphorus in these siliceous ores is always under 0.075.

METHOD OF MINING.—The discovery outcrop is about 100 feet below the summit of the hill. An open cut was begun about 20 feet below the outcrop and carried in until the walls were 100 feet high. The mountain, rising faster than the ore body, gave a constantly increasing over-burden to remove; and this, with the difficulty of holding the side walls, led to the abandonment of open-cut work and the beginning of underground mining in 1898. A tunnel was driven into the ore body from the open-cut level, and from the same level a shaft was sunk 110 feet and two levels were opened. The mine is drained by a tunnel on the bottom level connecting with the shaft.

The ore is usually stoped for the entire width of the deposit, both heavy timbering and supplemental filling being required. At some points it is necessary to leave pillars of ore in place, to be extracted when the stope is about to be finally abandoned. The ground is difficult to hold, because of the decomposed rocks surrounding the ore and the large masses of clay associated with it. Occasionally a pocket of clay is opened which is under heavy pressure from the surrounding rock or ore. As soon as an outlet is furnished, the clay begins to flow into the stope in a plastic mass; and great difficulty is often experienced in checking this flow. The most satisfactory method of working—indeed, the only one by which the soft clay walls can be held—is to keep the stopes filled to within about 7 feet of the roof. The ore shoots and man-ways are built up from the level below, as the filling is carried up. The material for filling, apart from what is furnished from waste in the mine, is obtained outside, on the open-cut level.

Square-set timbering has been used in large stopes, but it has been found better and cheaper, where the filling system was employed, to support the roof with cribs of round logs, which accommodate themselves, without damage, to the shrinkage of the newly filled material and the pressure from the ore.

The ore from the lower levels is hoisted to the open-cut level by a gasoline hoist, which was installed on account of the difficulty of obtaining a supply of water through the dry season.

The ore is hand picked on the open-cut level, the large pieces going direct to the tramway which connects the mine with the railroad, while the small pieces and finely powdered ore are transported separately, taken to the log washer, and screened after washing.

The size above 0.5-inch mesh is hand picked and

* Abstract from Transactions American Inst. Mining Eng.

shipped; the finer portion being reserved until a suitable concentrating plant shall have been erected. This care in sorting the ore is rendered necessary by the presence of particles of jasper in the ore, which, if not removed, subject the ore to a penalty for silica.

The ore is stored on the upper level in a fifty-ton bin at the loading terminal of a Bleichert tramway. The tramway, about $\frac{1}{2}$ mile in length, has its upper terminal 420 feet above the railroad to which it conveys the ore. At the railroad there is a 300-ton ore bin, from which the railroad cars are loaded. The tramway is operated by gravity, the descending loaded buckets developing 6 H. P. All mine supplies, timber, etc., are brought up to the mine on the tramway, which has a capacity of twenty-five tons per hour.

Hand drilling was used until the present year, when, on account of the difficulty of obtaining laborers during the revolution in the country, an air compressor was installed, driven by a 35 H. P. gasoline engine, and power drills are now used.

Electro-Magnetic Ore Dressing.

Written for the MINING AND SCIENTIFIC PRESS by W. G. SWART, Metallurgical Engineer.

Not long since, in a semi-technical magazine article, the statement was made that static electricity had not yet been harnessed to any commercial use. If this be a correct statement it becomes my pleasure and privilege to not alone chronicle the first commercial use of static electricity, but also the fact that such use is in the field of ore dressing.

In February, 1901, letters patent were granted Lucien I. Blake, professor of electrical engineering of the State University of Kansas, and Lawrence N.

jack," but only such as is removable by separation of the crystals or particles.

So little has been done toward applying static electricity to commercial uses, and so little is known of its requirements in handling, that it has been no easy matter to work out a successful commercial machine. The problems of proper distribution of the electric charge over the several parts of the machine and successful insulation of high voltages in the face of dust, moisture and mill conditions generally, are but two of the many solved. A simple means of controlling the effect of violent fluctuations of the static charge has been found, its only disadvantage being a slight decrease in unit capacity of the machine. The voltage has gradually been reduced from 250,000 until now perfectly satisfactory work is being done at from 10,000 to 20,000 volts, representing a spark from $\frac{1}{4}$ to $\frac{1}{2}$ inch in length. A static generator has been devised by Prof. Blake and Mr. Morscher, constructed almost wholly of metal, using no glass whatever, self-exciting and able to run continuously in the open air without regard to atmospheric conditions, and with no more attention than an ordinary dynamo receives.

The separating machines, as at present constructed, have a nominal capacity of from twelve to fifteen tons per twenty-four hours, working on blende concentrates at 30-mesh. As in most other methods of ore dressing, the capacity is largely governed by the mesh, coarse material passing through rapidly, while fines go more slowly. The Blake-Morscher machine works well on some material at 6-mesh and will also handle material at 200 mesh with but slight change of construction or adjustment. As in other methods, sizing improves the products, but close sizing is not essential nor even desirable. On an 8-mesh jig concentrate a sizing at or near 20-mesh will usually give the best results, coarse and fine being handled separately on the same machine, which

rator without sizing or roasting, at the rate of 16.11 tons per twenty-four hours.

RESULTS.—Assays and weights of separated products:

Metal.	Original Material.	Iron Concentrates, 18 22% of total weight.....	Clean Zinc Blende, 80 21% of total weight.....
Zinc.....	49.20%	3.60%	60.69%
Iron.....	9.62%	39.24%	2.02%
Lead.....	2.28%	8.89%	Trace.
Silica.....	4.60%	5.00%	3.10%

REMARKS.—By "silica" is meant "insoluble residue."

A loss of 1.57% in weight is due to dust, samples taken during run, etc.

Any copper present is thrown with the iron and lead.

Sizing this material at 20-mesh, putting the fine and coarse over separately and combining the final products, gave better results, the clean zinc product carrying 61.81% zinc.

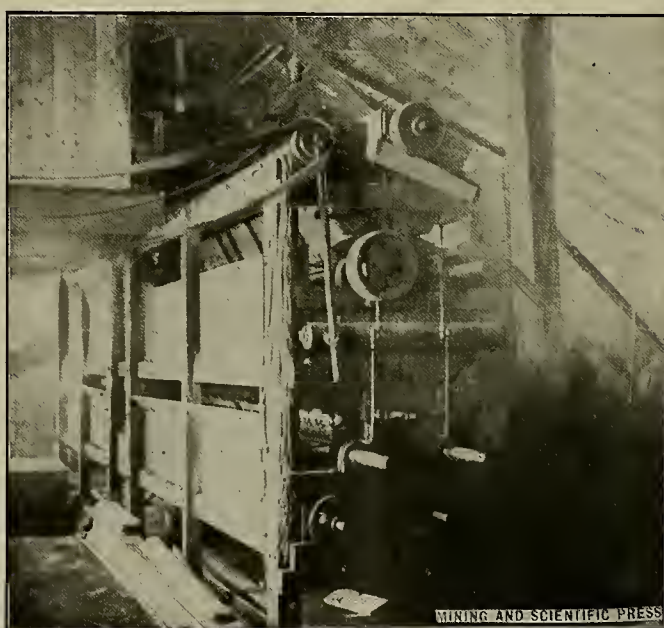
On the Colorado "black jack" ores I quote the following illustration:

ORE.—Leadville zinc and iron middlings.

(NOTE.—The Leadville crude ore is a solid mixture of sulphides of lead, zinc and iron, with practically no gangue. This is crushed to 30-mesh by rolls and concentrated wet on Wilfley tables which take out the greater portion of the lead, at the same time discarding a portion of such silica as may be present. The remaining "middlings" product, consisting of



Electro-Magnetic Ore Separator.



Electro-Magnetic Ore Separator.

Morscher, of Neodosha, Kansas, graduate student at the Kansas University, for a process of ore separation and apparatus based thereon. Briefly stated, the method consists in bringing a mass of ore particles into contact with a statically charged metallic surface. Such particles as possess relatively high conductivity are instantly repelled, while those of low conductivity are not repelled until sufficient time has elapsed to allow them to be pulled out of their original path and caught in a separate receptacle, thus effecting a separation from the conductors.

For a considerable period prior to the issuance of these patents a machine had been in successful operation in Denver, working on miscellaneous ores, and in many cases with notable results. This machine has since been simplified and compacted and the details improved until it is now doing steady and satisfactory mill work.

It is found by experiment that most of the sulphides and many of the other compounds of the valuable metals possess high conductivity, while the gangue consists largely of non-conducting material such as quartz, lime, etc. There are exceptions on both sides: The compounds of zinc, for example, are non-conductors, thus allowing a separation to be made between pyrite, galena and chalcopryrite on the one side, and zinc blende on the other, with no preliminary roasting, dryness being the only requisite. Magnetite and pyrrhotite may also be separated from blende. It is immaterial whether the blende be the "rosin jack" of the Joplin fields or the "black jack" of Colorado, the action being identical on both. Since this separation is mechanical and not chemical, the combined iron cannot be taken from "black

jack" double for the purpose. The standard machine is a double one 24 feet long, 41 inches wide and 81 inches high, using about 1 H. P. This latter covers generation of the static charge and is the total power consumed by the machine. The machine is constructed chiefly of wood, there being no complicated or expensive parts, and but few wearing parts. The cost of construction does not exceed \$900, including static generator, Denver prices.

As typical of the work of the machine I give the following results from my record, taking fair sized lots rather than hand samples. One peculiarity of the machine is that it has invariably done better work in quantity than was indicated by preliminary hand samples.

On the mixed sulphide concentrates of the Missouri-Kansas district, consisting of rosin zinc with a greater or less admixture of pyrite and galena, the machine does its best work, on ores so far tried. I select the following run from among many:

ORE.—Joplin jig concentrates, bought in the open market at Joplin.

WEIGHT.—482 pounds.

MESH TEST—

6 on 8 mesh.....	8.22%
8 on 12 mesh.....	6.85%
12 on 16 mesh.....	15.07%
16 on 20 mesh.....	12.93%
20 on 40 mesh.....	24.35%
40 and finer.....	32.57%

There is thus 43.97% coarser than 20-mesh and 56.92% finer.

TREATMENT.—Put over the Blake-Morscher sepa-

pyrite, pyrrhotite and "black jack," which in this case is a mixture of blende and marmatite, is dried and put over the electrical separators.)

WEIGHT.—2958 pounds.

MESH TEST—

30 on 60 mesh.....	33.8%
60 on 100 mesh.....	28.0%
100 and finer.....	38.2%

(NOTE.—17.8% passes 200 mesh.)

TREATMENT.—Put over the Blake-Morscher separator without roasting or sizing, at the rate of 12.83 tons in twenty-four hours.

RESULTS.—Assays and weights of separated material:

Metal.	Original Material.	Iron Concentrates, 47.80% of total weight.....	Zinc Blende Product, 50.88% of total weight.....
Zinc.....	30.37%	8.14%	51.18%
Iron.....	20.14%	35.14%	8.80%
Lead.....	4.60%	9.05%	10.60%
Silica.....	3.30%	4.60%	2.70%

REMARKS.—"Silica" is "insoluble residue."

A loss of 1.22% of total weight is accounted for in dust, samples taken during run, etc.

At the works of the Colorado Zinc Co. at Denver

one of these machines has been steadily doing this same class of work for some little time, and others are to be put in shortly there and elsewhere. The owners of the patent are careful, conservative men, preferring to go slowly with such an innovation, hence publicity has not been sought but rather avoided.

The machine is not confined in its operations to ores of zinc. All metallic substances, most sulphides and arsenides, and some carbonates and oxides are thrown out of a siliceous or limy gangue, in many instances the saving of values being very high. This is particularly true of the sulphides of copper.

The machine as ordinarily constructed makes no final middlings, the final separated products containing all the material originally charged. It can be arranged in the case of coarsely crushed ores to deliver a middlings product for re-crushing when necessary.

Considering the fact that here is a machine low in first cost and with a nominal operating expense, that it separates materials without regard to their specific gravity, that it works well at any mesh between 8 and 200, that no roasting of sulphides is necessary, that no water is required, that no piece of the machine weighs 100 pounds, that any intelligent mill man or mechanic can build one and keep it in repair, it is not too much to say that these results are remarkable and a valuable addition has been made to the science of metallurgy, for which due credit should be given to Prof. Blake and his associates.

The engravings accompanying this description are of the machine at the Colorado Zinc Works in Denver.

Denver, January 17.

Mines and Metallurgy at the St. Louis Exposition.

The exhibits of the Exposition will be presented in fifteen departments, which cover in their scope every phase of human endeavor and the earth's resources.

is being erected, and arrangements and appropriations for which department have been provided. The accompanying engravings illustrate the mining building from various points of view.

Precipitation of Copper Cyanide Solutions.

Written for the MINING AND SCIENTIFIC PRESS by
R. STUART BROWNE.

"It is one problem to dissolve the gold, and several problems to precipitate it."

I don't know who first recognized this fact and put it into the above concise statement, but whoever it was deserved an M. E., for he had learned cyaniding in a hard school, that of experience. It has been my luck to be continually running up against some problem in precipitation brought about by the presence of copper. A small amount of copper in the zinc box will frequently act beneficially in the precipitation of gold and silver by the formation of a couple. But I have observed that this excellent servant very soon becomes a very bad master. I prefer to dispense with his services, for after he has once gained a foothold on the zinc his removal is always attended with considerable trouble. Unlike gold and silver, which form a spongy precipitate on the zinc, the copper deposits a hard film, which prevents further contact between the zinc and the solution. Zinc in this condition is not necessarily rendered useless. Copper is soluble in strong cyanide solutions, so that by raising the strength of the solution flowing through the box the copper can be removed. Just what the proper strength should be is a matter that must be determined by experiment. In working ores containing copper I use very weak solutions, which on leaving the leaching vats seldom carry over 1.5 pound of free cyanide per ton. By raising this to 10 pounds

use a strong solution in leaching ores containing copper, for the selective action of cyanide for copper increases with its strength. There is a chemical law governing the amount of cyanide necessary to keep the copper in solution. If the amount of cyanide remains constant and the copper accumulates, a point will be reached when the copper will precipitate on the surface of any exposed zinc. In dealing with the problem of precipitating from copper solutions I keep one rule in mind: "Don't use any more zinc in the boxes than is necessary, the amount to be governed by the quantity that can be kept coated with gold and silver." There is no use in filling up a dozen compartments with zinc when the first three or four precipitate the gold and silver and the others copper. It is much easier to keep a small amount of zinc in working condition than a large amount. Working along on this line I get a successful precipitation from the most unfavorable kind of solutions. As the copper accumulates in the solution it becomes impossible to add fresh zinc to the boxes without an immediate precipitation of the copper. Raising the strength of the solution does not help the matter, for the copper acts quicker than the cyanide. It becomes necessary to give the zinc a protective coating before placing it in the zinc boxes. In the Betty process the shavings are dipped in a solution of lead acetate. This gives a coating of spongy lead, which not only protects the zinc from the copper, but assists the precipitation of the gold and silver by the formation of a couple. The usual method of procedure is to make up a 10% solution of lead salt, dip the shavings into it, then pack the boxes and run strong solution through for twenty-four hours, gradually reducing the strength to the normal figure. I can see no reason for making the lead solution up to any definite strength. Any will do, provided it contains sufficient lead to cover the zinc. Before dipping, the zinc should be pulled apart to make it fluffy. All of the little hard balls formed during the cutting should be removed. It is in these balls that the copper and other base metals find a foothold, from which it is almost impossible to remove them.

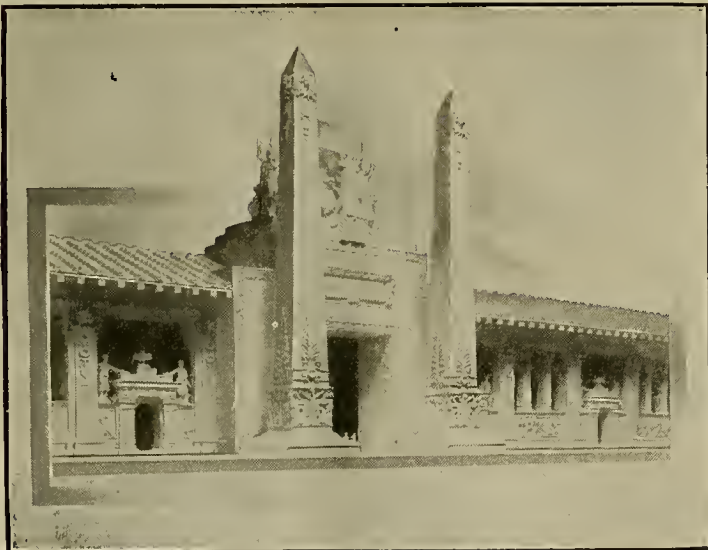
The thickness of the shavings is a very important matter. I have found that the thinnest of machine-cut shavings give the best results. It is easier to keep them free from copper than the coarser kind. To get a box ready for precipitating, I first clean it out thoroughly, then pack my dipped shavings in loosely, but pressing them down more firmly along the sides. As soon as one compartment is filled I run in fresh water to prevent oxidation. This oxidation of the zinc I have not seen spoken of before. It is a very important matter, for it is the cause of a great deal of poor precipitation. In a cleanup it is customary to wash the shavings and then to put them to one side, to be replaced later. If the zinc is not covered with either water or solution it commences to heat. The rise in temperature is due to the formation of a film of oxide on the zinc. After this the shavings are almost useless for precipitation. After being once wet they should never be allowed to dry again. When all of the compartments are packed I run clean water through them until the cloudiness due to the formation of basic lead salts has passed away. Giving the zinc a water wash is unusual, but I have found it beneficial. I then add solid cyanide to each compartment and turn in a rich solution, which is brought up to about 3 pounds strength. The next



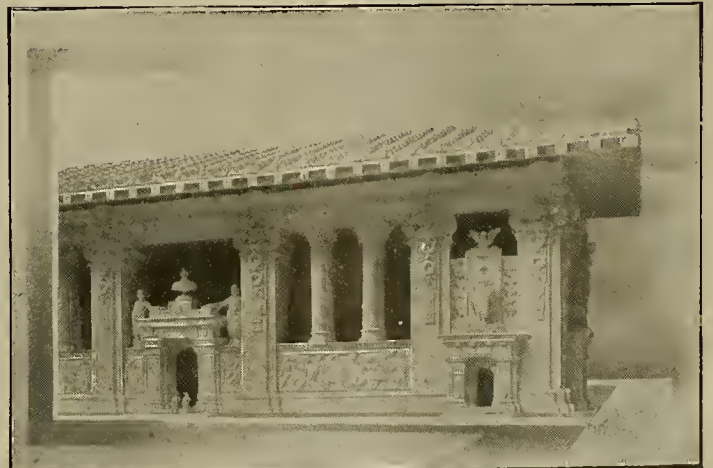
Mines and Mining Building, St. Louis Exposition, 1904.

The achievements, history and possibilities in mining and metallurgy are to receive special attention and extensive treatment and display at the Exposition of St. Louis, 1904. The authorities of the Exposition

strength (0.5%) I can usually clean the copper out of a box in forty-eight hours. It is useless, however, to attempt to remove the copper unless it can be replaced with either gold or silver or some other metal,



Portal Mining Building, St. Louis Exposition, 1904.



Mines and Mining Building, St. Louis Exposition, 1904.

have given the various materials, industries and pursuits which are included or implied under the heading, "Mines and Metallurgy," such as working of mines, ore beds and stone quarries; minerals and stones and their utilization; mine models, maps, photographs; metallurgy, literature of mining, metallurgy, etc., a leading place in the classification of the Exposition. These have been embraced in one of its principal departments, a special building for which

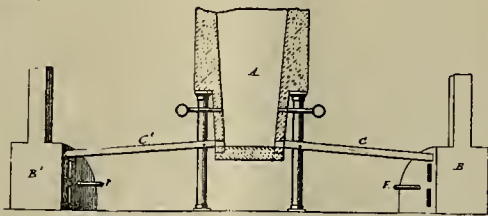
for on reducing the strength of the solution the copper will immediately reprecipitate. For this reason a rich solution should be run through while the zinc is being cleaned. Once the zinc has been given a protective coating there is very little further danger from the copper, and the strength of the solution may be reduced. It would seem that if strong solutions were always used there would be very little trouble from the copper. But it is not advisable to

day the solution is allowed to fall to its ordinary strength. When it becomes necessary to add fresh zinc I first dip the shavings and then wash them thoroughly in a tub with a slow-running stream of water. At the present time I am precipitating from a solution carrying about 4.5 pounds of copper per ton, \$4 in gold and 1.5 ounce of silver. The precipitating boxes contain three compartments, each 18 inches square in the clear. The rate of flow is 1 ton

per hour through each. After leaving the boxes the solutions seldom assay over 20 cents. The precipitation of the silver is always complete. The tailings resulting from pan amalgamation always contain considerable copper and floured quicksilver. The quicksilver, which readily dissolves in the cyanide and precipitates in the boxes, exerts such a beneficial influence on the precipitation of the gold and silver that the presence of the copper occasions no trouble. While connected with the Nevada Reduction Works at Dayton, Nev., a couple of years ago, I had an excellent opportunity of observing the action of quicksilver. In addition to cyaniding the ore coming from their own mill, the company was treating a considerable quantity of tailings from one of the old Comstock pan mills. The quicksilver was completely precipitated in the first three compartments. The shavings would turn white and become very brittle. The precipitation of the gold and silver might be called perfect. An assay of 300 cubic centimeters of solution that had passed through the boxes would not give a weighable bead. At the same time all of the zinc in the lower compartments was completely coated with copper, while not a trace was to be seen in the upper ones. Below the fourth compartment the precipitation of the values was practically nil. The solution running through the boxes usually contained less than 1 pound of free cyanide per ton. An interesting fact was the recovery of a considerable quantity of amalgam from the boxes during the monthly cleanup. After refining the precipitate in the usual way—with sulphuric acid—the quicksilver was recovered by retorting. The amount thus recovered was considerable. The most rapid and convenient way of determining the amount of copper in a cyanide solution that I have found is a modification of the method devised by A. H. Low for determining the copper in an ore. I take from 50 to 100 cubic centimeters of the cyanide solution and add H_2SO_4 until it is strongly acid. The acid will throw down a portion of the copper as cuprous cyanide. This precipitate is white and curdy, somewhat resembling silver chloride. The solution is now brought to boiling over a laboratory lamp to drive off the free hydrocyanic acid. After a few minutes nitric acid is added, a drop at a time, until the cuprous cyanide is completely dissolved. About 5 grams of sheet zinc is then added to throw down the copper. The excess of zinc is then dissolved by a fresh addition of H_2SO_4 and the residue washed by decantation. The copper is then redissolved in nitric acid, NH_4OH added, and the copper determined by titrating with standard KCy.

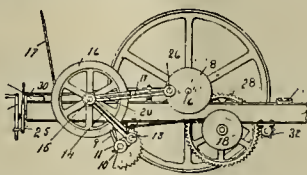
of normally insoluble salts soluble in water, then washing away the soluble portion with water, treating remainder with hot alkaline solution, again washing with water.

PROCESS OF SEPARATING PRECIOUS METALS FROM THEIR ORES.—No. 718,087; F. R. Carpenter, Deadwood, S. D.



The process of treating dry ores for separation of gold and silver which consists in smelting ores with sufficient basic material to form slag, and insufficient fuel to effect any material reduction of contained metals, and bringing resulting molten mass into contact with molten metallic bath capable of absorbing precious metals from matte.

WELL DRILLING MACHINE.—No. 718,112; H. H. Everhard, Massillon, Ohio.



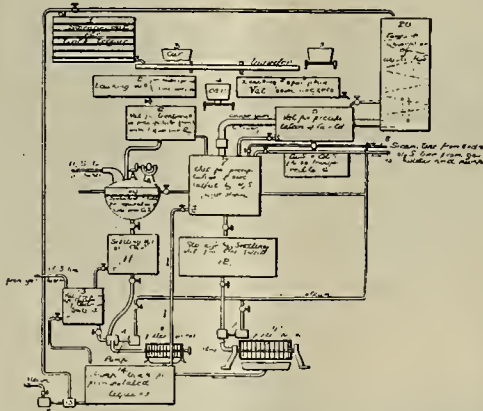
In well drilling machine, suitable frame, power shaft provided with a crank, shaft provided with toothed segment, worm gear meshing with toothed segment, means for rotating worm gear, links connected to shaft provided with toothed segment, swinging arms carrying an axle and drill operating wheel, and swinging arms and links fixed to toothed segment shaft hinged together, and pitman connected to crank of power shaft and to axle of rope operating wheel.

MINER'S LAMP.—No. 718,128; J. Jacobsen, Lethbridge, Canada.



In miner's lamp, combination with plate or bracket having upper rearwardly curved top securable to cap and forwardly curved bottom end securable upon vizor of cap, and intermediate forwardly projecting cheek plates having downwardly and forwardly slanting notches, of lamp having side trunnions adapted to rest in notches; and friction held hooks 14 closing notches to prevent accidental displacement of trunnions; and combined hook and handle 18, fixed to rear of upper part of lamp and projecting above same, and clearing for hook in bracket.

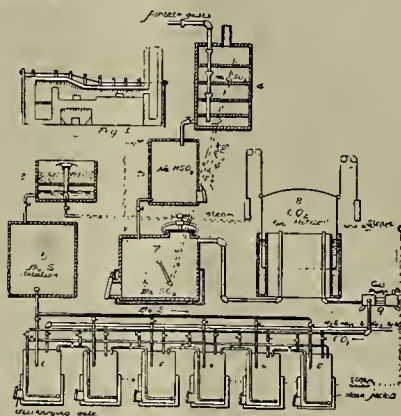
METHOD OF EXTRACTING ZINC.—No. 718,554; W. G. Waring, Tyrone, Pa.



The process of leaching crude zinciferous ores, residues or products by leaching agent consisting of dilute acidulated water containing not more than 1.5% free sulphuric acid, together with indefinite amount of dissolved ferric sulphate; precipitating metals of copper group by agitation with slight ex-

cess of soluble sulphide, and finally separating zinc by means of hydrogen sulphide.

METHOD OF MAKING PURE HYDROGEN SULPHIDE FROM FURNACE GASES.—No. 718,556; W. G. Waring, Tyrone, Pa.

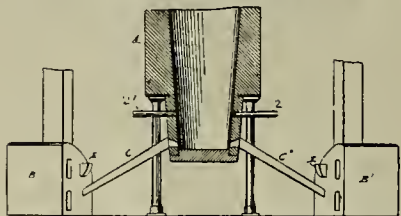


Method of converting sulphur dioxide contained in furnace gases or in other admixture into pure hydrogen sulphide, which consists in absorbing sulphur dioxide in strong solution of sodium sulphite, combining sulphur dioxide so absorbed with barium, by means of reacting upon barium carbonate with acid sodium sulphite so produced; storing evolved pure carbon dioxide; reducing barium sulphite thus produced to barium sulphide by means of calcination with coal, finally causing carbon dioxide stored to react upon barium sulphide, so as to produce hydrogen sulphide, with regeneration of barium carbonate.

PROCESS OF RECOVERING PRECIOUS METALS FROM MATTES CONTAINING THEM.—No. 718,089; F. R. Carpenter, Denver, Colo.

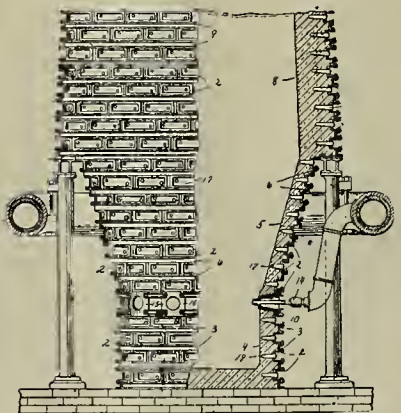
The process of separating precious metals from matte containing them, which consists in causing intimate mixture of matte with metallic iron and subjecting mixture to bath of molten metallic lead.

PROCESS OF SEPARATING PRECIOUS METALS FROM ORES.—No. 718,088; F. R. Carpenter, Denver, Colo.



Process of separating precious metal from iron matte containing it, which consists in bringing molten iron matte containing precious metal and molten metallic lead in contact with each other and subjecting former to oxidizing atmosphere.

BLAST FURNACE.—No. 718,313; W. C. Coffin, Pittsburgh, Pa.



In blast furnace combination of hearth having outer wall consisting of horizontal bands or rings formed of channel bars, cooling plate holding devices interposed between adjacent bands or rings, hosh having outer wall sustained by outer wall of hearth, hosh outer wall being formed of plurality of hands or rings formed of Z-bars, and cooling plate holding devices interposed between adjacent Z-bar rings, thereby forming a continuous metallic outer wall for hearth and hosh.

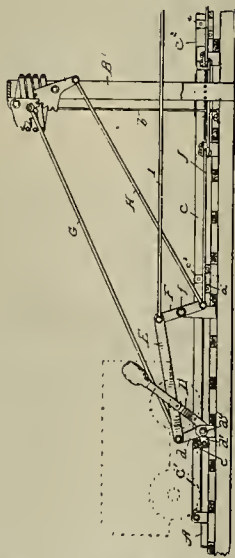
THE ore from Gold Hill, Or., is marcasite, a light-colored iron sulphide. It may be gold bearing. The small flat crystals in the cavities are characteristic of the mineral. Its hardness and streak are also characteristic.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 13, 1903.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINE GATE.—No. 718,138; J. M. Marty, Cleveland, Ohio.



In mine gate, combination with track rail, of secondary rails on each side of gate, weighted levers attached to secondary rails, curtain mounted in frame and operated by a pair of lazy tongs, and rods for connecting secondary rails and weighted lever to lazy tongs, whereby curtain is raised as car approaches gate and lowered as car leaves gate.

METHOD OF REDUCING ORES.—No. 718,099; S. C. Currie, New York, N. Y.

Method of treating pulverized ores containing precious metals and other substances, which consists in treating ore with a heated gaseous compound containing oxygen, at temperatures which render some

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The Alaska Dispatch says the Sumdum Co., near Juneau, have struck their ore body, finished their up raise, and the stamps are dropping. The ore body cut in the Old Chief shaft runs \$16.

A strike is reported at Tanana district, on the American side. Japanese arriving in Dawson from the diggings verify the statements. Many are leaving Dawson. The weather is very cold and travel is heavy over the new mountain trail to White Horse.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—The property of the Dragoon C. M. & S. Co., at Pearce, is being developed. The gallow-frame at the new shaft has been finished and a 34 H. P. gasoline hoist is installed. Work has been resumed in the shaft. The shaft is down 80 feet and the indications are good at that depth. A millsite with plenty of water has been secured, and the building of a smelter is being considered. Four miles of wagon road have been made the past two months, and a steel track, 700 feet in length, is being laid from the foot of the mountain, to facilitate raising of materials to the mine by means of cars and cable. The Dragoon claims, twenty in number, are in the Dragoon mountains, west of and adjoining the property of the Black Diamond C. Co. The latter company is completing a 200-ton smelter, which will be blown in about Feb. 1. A tramway 1½ mile in length is in operation.

Pearce, Jan. 13.

The Copper Crown Co. reports cutting a body of sulphide ore on its property in development work. The group consists of fourteen claims near the Black Diamond mines in the Dragoon range, near Tombstone.

At the Tombstone Con. M. Co.'s shaft they are 75 feet below the 600-foot level.

G. Moran, superintendent of the Golden Era mine in Easter Sunday district, near Bisbee, says one of their shafts is down 125 feet and sinking.

Manager J. S. Palmerlee, the Huachuca Con. M. Co., in the Huachuca mountains, near Bisbee, says the crosscut being driven for the Gertrude ledge is in 70 feet and is expected to cut the vein at 125 feet.

COCONINO COUNTY.

The smelter of the Anita Con. C. Co. at Williams is in operation. H. I. Nesmith is manager.

GILA COUNTY.

H. J. Sisty, developing the Sultan group of claims in Lost gulch under a lease and bond, says that in the Badger claim the drift at 120 feet depth is being extended, and for the last 30 feet has been on a 2-foot vein carrying gold and lead.—On the Cedar Tree work was resumed at the point where the vein appeared to have faulted, and, after crosscutting a few feet, the lead was recovered. The ore in the Cedar Tree is similar to that in the Badger, averaging \$45.—On the Montana shaft has been sunk to 40 feet and is in ore that will average \$6 gold.

Manager V. V. Clark is building a 10-stamp concentrating plant and a 500-foot tramway from the shaft to the mill at the Yo Tamblen, near Globe, with thirteen men. C. Crowley has struck a sulphide ore in the tunnel on the Hal and Al. He has developed a body of carbonates in the 45-foot winze in the tunnel, but had to stop on account of water. At the Great Republic group, adjoining the McNally claims, the main tunnel, 250 feet, in sulphide copper ore, has caved and is being cleared and timbered.

MARICOPA COUNTY.

The Maricopa mine near Cave Creek is reported sold to Galpin & Son, N. Goff, W. K. James, C. Davies and S. F. Fitchett, of Prescott, for \$18,000. The Maricopa is near the Phoenix mine.

MOHAVE COUNTY.

The Chloride G. M. Co., operating the Samoon and the Fourth of March mines in the Wallapai district, 3 miles east of Chloride, are shipping \$100 ore to the smelter. L. Hoffman is manager.

J. Barry has let a contract for 100 feet of tunnel on the Gold Nugget mine at Cerbat, near Stockton Hill, 14 miles north of Kingman.

PIMA COUNTY.

(Special Correspondence).—The Loma Verde C. Co. is developing fourteen claims 15 miles east of Tucson. A shaft is down

350 feet and a crosscut at the 100 level is in 100 feet. Stations have been cut at the 200 and 300 levels. The ore contains copper and gold, averaging \$50 to \$75 per ton. Tucson, Jan. 19.

Baxter, Irish & Ellis, working the Twin Butte mines, 27 miles south of Tucson, have a shaft on the Glance 185 feet and have crosscut 45 feet in ore. They have a shaft 125 feet deep on the King claim. There are nineteen claims in the group.

PINAL COUNTY.

In Quezon Creek district, 4 miles from Silver King, the Sieboth Co. has forty men at work on the Lobb mines, with one tunnel in 325 feet and the second 240 feet.

SANTA CRUZ COUNTY.

The Nogales Co. will install two 100-ton reduction plants—one to be at the Buena Blanca mines, near Nogales.

YAVAPAI COUNTY.

(Special Correspondence).—The Clune M. Co., in the Mineral Paint district, have four men driving the tunnel of the Maud mine. The ore runs \$30 to the ton. Prescott, Jan. 20.

During the shut down at the United Verde mine at Jerome, the 250 ton water-jacket furnaces at the smelter were replaced with 500-ton furnaces.

The Red Apache mine, near Lynx creek, owned by W. Lacase, is showing an ore body 3 feet wide, carrying gold values. The tunnel is in 135 feet.

North of the Lynx creek dam a strike is reported in the North Star mine by S. W. Gleason & Co. The ore body is 4 feet wide and runs \$10 in gold.

Work has begun on the Gold Nugget and Union mines, east of the Lynx creek crossing on the McCabo road.

The White Horse Co. is opening up a prospect 1 mile south of their hoist and have cut a body of ore running \$50 in gold.

H. B. Clifford has bought the Peck property, 36 miles from Prescott in the Bradshaw mountains, and will put in machinery to unwater the mine.

The Iron Queen mine, owned by the Treadwell Co., is down 315 feet. They have thirty-five men at work and intend to sink to the 500-foot level. The ore carries copper and gold values.—The Treadwell Co. has a hoist on the Hackberry mine and five men at work hoisting water, with 150 feet of water yet to raise.—The French Lily mine, on Turkey creek, is down 190 feet.

Two cars of ore from the Gladstone dump, at Big Bug, were shipped last week.—It is reported the Jesse mine, in Chaparral district, will resume.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—P. Eichelroth, superintendent of the Sand Pile mill, owned by Fricot & Miller, has returned from San Francisco and the southern counties of the State investigating cyanide plants. The Confidence plant, 15 miles east of Sonora, in Tuolumne county, he considers best adapted to his purpose. Mr. Eichelroth will erect a cyanide plant of 300 tons capacity, near Forest Home, for the treatment of tailings from the Plymouth Con. mines at Plymouth. Plymouth, Jan. 19.

CALAVERAS COUNTY.

(Special Correspondence).—W. E. C. Eustes, president of the Melones M. Co. of Boston, Mass., who arrived here a couple of weeks ago with W. B. Devereux, managing director of the company, has returned to Boston. Mr. Devereux will go to New York in a few days. The offices of manager and superintendent have been consolidated, F. Langford having been appointed to the position on Jan. 13. Development work is progressing and sixty stamps are dropping. Mr. Devereux is making tests and experimenting on treatment of the ore, to lessen the cost of handling. At present the ore is being hauled from the tunnel 4000 feet to the mill by four cars, of eight tons capacity each, drawn by electric locomotive. Melones, Jan. 20.

(Special Correspondence).—The '49 Gold Placer M. Co., under direction of J. M. Evans, superintendent, are erecting a gallow-frame and placing the hoist formerly at the Lightner mine on their property at Douglas Flat. The hoist will be run by steam with water power auxiliary, and will be working Feb. 15, when the shaft will have reached the 200 level, where it is expected bedrock will be struck. Two 14-inch pumps are also being put in.

T. H. Fullen, superintendent of the Angels Quartz M. Co. at Angels, says the 20-stamp mill crushes 100 tons daily.

At the Lightner mine at Angels, under management of A. Chalmers, a new change room, containing shower baths, has been put in. Each man is given a

wash sult and locker, which he is required to keep in order. An emergency room has been added for use in case of accidents, supplied with such articles as are required for first aid. A new hoist has been put in costing \$5300, the old hoist being too light for the required work. Fuel oil is used and large tanks have been erected. Oil is also used in the chlorinating plant; a saving of 40% on fuel cost is reported. The company has bought a portion of the Lindsay lot, south of the mill, giving room for additional stamps to be added to the forty as soon as the lower levels have been opened. Sixty-three thousand tons of ore were crushed by forty stamps in 1902. The reported profit for 1902 was \$119,065.90, of which \$51,127.50 was paid as dividends and \$36,428.86 as balance of amount due on the purchase of the mine. Angels, Jan. 19.

(Special Correspondence).—The Union C. M. Co., operated by the F. L. Ames estate of Boston, Mass., under superintendency of David Ross, are working twenty men on repairs and preparing to resume operations.

Copperopolis, Jan. 19.

At the Independence mine, near Angels, they are putting in a 65 H. P. boiler and a 10-inch pump. The shaft is down 50 feet.

A 40-foot water wheel has been put in the Claxton mine to unwater the mine.

The Beatrice mine, near Murphys, has been closed down.

DEL NORTE COUNTY.

At Camp Crawford in Diamond Creek district eight men are at work in the Crawford copper mines. A tunnel is being driven to tap the ledge on the 500 level and is in 295 feet.

EL DORADO COUNTY.

The mill at the Esperanza mine, near Garden Valley, has been sold to the Gold Tunnel M. Co. and will be taken to Placer county.

A 10-stamp mill is to be put up on the Crystal mine, near Omo.

FRESNO COUNTY.

The Esperanza, in the Coalinga district, has completed another well.

INYO COUNTY.

(Special Correspondence).—The Arroyo G. M. Co. of Los Angeles have a 100-ton plant in operation in the Argus mountains. A tramway will be built. A large vein is reported. It is expected that the cost for chemicals and treatment of the ore after crushing will be very low. They expect to mine and mill the ore for \$1 per ton. The ore averages \$4.60 per ton.

The Cecil R. G. M. & M. Co., owning mines in South Park district near Ballarat, are installing a 10-stamp mill and cyanide plant, to be in operation by the 15th of February. Development work is pushed with twenty men. An addition to the mill is anticipated. There is 600 feet of development work done. Ballarat, January 19.

The Roosevelt Oil Co., operating near Hawaii, has 13,000 feet of lumber at Keeler to be used in building eleven oil derricks. The well is down 1100 feet.

KERN COUNTY.

J. E. Beard and W. W. Stevenson are drilling near the Spellacy wells at Midway. The Paraffine Oil Co. has resumed drilling at Tembler.

A corporation, to be known as the California Con. Oil Fields Co., is to be formed by H. A. Blodgett and S. Jewett of Bakersfield, who own large interests in the Sunset field, and foreign capital, to handle the product of the Sunset and Midway districts. The corporation takes in all producing properties in these two districts. They will erect five tanks of 35,000 barrels capacity each, and add to them when necessary. The capacity of the refinery at Sunset will be enlarged. A pipe line 10 miles in length, exclusive of laterals, will be constructed to connect the Sunset and Midway districts with the terminus of the Sunset Railway, where the tanks will be located. The line will be constructed of 8-inch and 10-inch pipe, and the laterals of 4-inch and 6-inch pipe.

MADERA COUNTY.

(Special Correspondence).—The Jessie Belle M. & S. Co. will build a smelter on their property near Daulton. Two carloads recently shipped are reported to average 22% copper, about \$12 gold and \$5 silver. Sixty-six feet of work has been done on the Copper Queen mine, belonging to this company, and 118 feet on the Daulton mine.—T. S. Orr of Denver, Colo., recently bought the old Buchanan mine in that vicinity and has it in operation.

Daulton, Jan. 21.

MARIPOSA COUNTY.

J. Helm and C. Czerny are reported to have taken out a pocket last week that

yielded \$1450, at the Tramp mine, at Whitlock, which they have on a bond.—Last week W. Dolph took out \$500 and ten tons of milling ore that assays \$50 per ton from the Hayseed mine.

NEVADA COUNTY.

The South Idaho M. Co. has secured an extension of bond for one year on the South Idaho, near Grass Valley.

The hoisting works of the East Orleans mine, near Nevada City, recently bought by the Gold Tunnel M. Co., were destroyed by fire on the 18th inst.

The Gold Tunnel M. Co. has a bond on the Gracie mine on Gold Flat, near Nevada City.

ORANGE COUNTY.

(Special Correspondence).—The Santa Ana Tin M. Co. is working ten men in Trabuco canyon on development; power drills are to be put in. The company own 7000 acres. Gold ore discovered will average \$5. Gall Borden of Alhambra is president.

Santa Ana, Jan. 21.

PLACER COUNTY.

At a recent meeting of the citizens of Forest Hill to prevent wholesale grabbing of timber land in the mineral belt in eastern Placer, a committee was appointed to raise funds to file a protest with the registrar of the land office.

Manager J. Manson has put in a 20 H. P. electric motor at the Calf Pasture mine, near Auburn, and the mine is being unwatered.

SACRAMENTO COUNTY.

The tunnel at Twin Brothers M. Co. quartz mine, near Folsom, is in 250 feet.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Giant Ledge G. & C. Co. are working on the north end of their mine near Manvel in the New York mountains. The Hard Cash is the principal one. The vein is 50 feet wide.

R. Young has a body of ore 6 miles west of Manvel. A crosscut in 70 feet has not found the wall.

The New York mines, known as the Alpha group, has 3000 feet of development which is being cleared out by Doak & Co., and a concentrating plant will be put in.

Thompson, Wheeler & Co. have bought the Boomerang mine and other property, owned by the Campbell estate at Vanderbilt, and have begun operations.

The Oro Rico Mining Syndicate is working in the south end of Providence mountains. A body of ore has been cut in the Confidence mine, which assays \$100 per ton. A mill and concentrator is to be put in. There are thirty mines in the three groups owned by this company. The Oro Rico Syndicate was formerly the Providence Gold Syndicate.

Manvel, January 20.

(Special Correspondence).—The Dean & Jones M. Co., Slate Range, are working sixteen men on development and cyaniding tailings, which have encroached upon the mill.

Randsburg, January 20.

Drillers working for the Riverside Water Co., a mile west of San Bernardino, struck a flow of boiling hot water at a depth of 350 feet. The water is heavily charged with sulphur.

A. P. Thompson & C. Colton at the Hunter-Paymaster mines on Old Woman's mountain, near Danby, have a tunnel in 360 feet and a shaft down 90 feet and a main tunnel on which they are working in 260 feet. This tunnel has another 100 feet to run to tap the ledge at a depth of 500 feet. In the Paymaster they have a tunnel in 50 feet and will run 50 more.

The Silver Wave mine of the Danby M. & M. Co. on Old Woman's mountain has shut down temporarily and its 10-stamp mill at Danby is idle. S. & W. Heath have six men doing development work on the Manoa.

SAN DIEGO COUNTY.

(Special Correspondence).—Banner is to have a smelter. Lumber and fuel are now being hauled to the site.

Banner, Jan. 19.

SHASTA COUNTY.

Twenty deputy sheriffs, armed with rifles and shotguns, guarded the entrance to the property of the Mountain Copper Co. on the 19th inst. It was the first attempt of the company to set men at work since the strike begun Nov. 21. With the deputy sheriffs stood fifty of the leading citizens of the town of Keswick, all of whom had last week signed resolutions commending the course of the company and condemning the position and demands made by the union. There were present 105 strikers, but no demonstration was made.

W. Dunham reports a 3-foot ledge of sulphide ore at 40 feet in the Mocking

Bird's lower tunnel on Mule mountain, 4 miles northeast of Igo.

The Original Quartz Hill G. M. Co., near Redding (known as the Polish Co.), will resume. Their property is the Kosciusko Con. mine and the Isaacs placer on Quartz hill.

A. C. Brokaw is putting an air compressor in at his quartz mill at Hull gulch, in Quartz valley, to run pumps, mill and drills.

W. G. Scott & H. Tarbot have located the Montelado and Riolado, east of the Afterthought copper mine, near Bella Vista. They claim they have a vein carrying 12% lead with silver.

Copper ore is reported at the Modoc Chief quicksilver mine of the Modoc Chief Co. on Clover creek, near Millville.

W. W. Adams, superintendent of the Balaklala copper mines of the Western Exploration Co., says operations are resumed.

SIERRA COUNTY.

At the Oriental mine, a mile from Alleghany, Superintendent H. L. Johnson has the lower tunnel in 1845 feet and driving at the rate of 6 feet a day. Three shifts and two machines employed. They expect to strike the ledge this week. The tunnel is 800 feet lower than the bottom of the shaft, which was sunk 600 feet on the ledge. Fifteen men are at work.

J. Bothwell has a contract from I. Copeland to run a tunnel to tap the Buckingham ledge on Jim Crow ridge, near Downieville.

SISKIYOU COUNTY.

The McKinley mine on Sucker creek, Humboldt district, near Fort Jones, owned by Koontz, De Witt & Martin, has been bonded and development work begun.

Machine drills are in operation on the main lower tunnel of the Cherry Hill mine, near Fort Jones.

(Special Correspondence).—The Yreka M. & M. Co.'s mill is in constant operation. The 20-stamp mill was started December 20. The ore from the upper claims is carried to the mill by a bucket tramway. The December mill run averaged \$7 per ton. The company anticipates a good season. The water supply is exceptionally good this year.

The Jumbo mine, White gulch, has closed down. L. A. Carter & Sons' crushing netted over \$40 per ton. They project a mill next summer.

Rollin, Jan. 19.

The Punch Creek mine in the Humbug district, 7 miles west of Yreka, has been sold to G. W. Grayson of Oakland, Cal., for \$30,000.

Superintendent E. A. Scott of the Con. M. & D. Co.'s plant, near Callahan, says "during the past few months' experimental work we found it impossible for the dredger to get all the gold on the bed-rock owing to its being hard and rough where the heavy gold lodges. In order to remedy this the dredger was set stationary and a pit dug to bedrock by hydraulic lifting and use of dredger. Afterward a hydraulic pump was set in the pit which handles the water and the giant drives the gravel into buckets of dredger which elevate it 50 feet to the dumps."

The Siskiyou Electric Power Co., at Fall Creek, on Klamath river, has finished the ditch, 4800 feet in length, which will carry the water of Fall creek to a point above the power house, where a fall of 700 feet is available to develop electricity for supplying light and power in southern Oregon and northern California. The power house is to be of stone and will contain four Pelton wheels of 1000 H. P. capacity each. J. Churchill is president and A. J. Roshorough secretary. The towns included in the lighting circuit are Jacksonville, Medford and Ashland, in Oregon, and Hornbrook, Klamathton, Lairs, Ager, Montague, Yreka, Fort Jones and Etna, in California; power will be furnished to twelve mines, two box factories, three grist mills, one paper mill, two pumping plants and two railroads. The head office of the company will be at Yreka. E. H. Stul has charge of the installation and is manager for the company.

TRINITY COUNTY.

Superintendent Bouery of the La Grange mine, near Weaverville, says he has twenty-five men at work and three giants in operation using 3200 inches of water.

The Miner's Dream group, near Weaverville, is sold to M. W. Musgrove of Spokane, Wash. The group consists of the Miner's Dream, Ray of Hope and Gold Standard claims, a water right of 3000 inches on Brown's creek and a tunnel site.

E. F. Burrill of Berkeley has an option to purchase for \$30,000 the Senger and Hughes placers, near Blue gulch, in Weaver basin.

Hall & Duvergy of the Globe mine, near Dedrick, are building a flume to take water from Bear creek which will give 680 feet pressure to run the compressor at the

tunnel to be driven from the Bear creek side. This tunnel will be 3000 feet long and tap the Globe ledge at a depth of 700 feet.

TUOLUMNE COUNTY.

(Special Correspondence).—Development on the Bell mine begun six months ago is progressing. The shaft is down 450 feet and sinking will be continued. W. J. Rule is superintendent.

Tuttle-town, Jan. 19.

The Norwegian Co., near Tuttle-town, has been reorganized by Boston men as the Norwegian Con. M. Co. C. F. Benedict, W. C. Henry, J. E. Crumb are the officers, with C. E. Whiteford, superintendent; W. A. Pierce, foreman. The mine has been unwatered and ore is being hoisted from the first and second levels. It is intended to enlarge the mill and sink the shaft deeper.

The tunnel of the Mayflower Co., near Groveland, is in 420 feet. An upraise will be driven to the gravel.

At the Cosmopolite, near Groveland, the crosscut is in 225 feet. This mine has been a large producer in the past.

The Magnet reports work suspended at the Neubeaumer mine, near Tuttle-town. On the 400 level in the Bell mine they have an ore body 15 feet wide and 185 feet long.

At the Soulshy mine, Soulshyville, the shaft is being sunk to the 300 level and drifting north for the new shoot is being pushed. A winze was sunk on this shoot at the 200-foot level, giving assays of \$100.

Work has begun on the drift to connect the Jumper and Golden Rule mines at Stent.

At the Black Oak, near Soulshyville, forty stamps are dropping. The shaft will be sunk to the 1400 level.

The Seminole G. M. Co. has bonded to C. H. Thomas of Carters the Seminole mine, near Carters, with the millsite and mill and machinery thereon for \$35,000.

J. Rocca has bonded to D. Cinelli, H. A. Ross and C. Simi, for \$5000, the Lenormande mine on the Rocca ranch at Algerine.

COLORADO.

BOULDER COUNTY.

The Wall Street gold extraction mill is in operation.

CHAFFEE COUNTY.

The Futurity M. & M. Co. at Newett have the main shaft down 260 feet and in ore carrying "peacock copper" (bornite).

An onyx quarry has been opened below Wellsville and a carload shipped.

The Salida E. & D. Co. have opened the Pay Car near Salida and will develop by tunnel.

The Sedalia G. & C. M. Co. has incorporated; F. Shine, J. Hamilton of Leadville and E. B. Green of Denver. They have a ten-year lease on the Sedalia copper mine 4 miles from Salida and will put up a mill.

CLEAR CREEK COUNTY.

The Wilcox tunnel of the Waldorf mines, near Georgetown, is in 1040 feet, and is going ahead with power drills at the rate of 6½ feet a day. The heading is in hotite gneiss.

Work will begin Feb. 1 on the second and third adits of the Johnson vein, near Georgetown, both of which show ore in the headings. The Owsley workings are being driven under contract. The heading shows an 18-inch vein of galena and zinc blende.

At the Little Mattie M. & M. Co., up Chicago creek, near Idaho Springs, in the fourth level a 2-foot streak of smelting ore, assaying six ounces gold, has been opened by Lessee Parker.

P. R. Stanhope of Denver will develop the Silent Friend mine near Dumont. The Sun and Moon mine is using electricity. The Newhouse tunnel having drained the shaft operations are resumed.

A shoot of sulphuret ore has been cut in the lower tunnel of the Buckeye, near Georgetown. The upraise in the sixth level of the Centennial is being driven in a body of smelting ore which runs \$40. The Prudential Co. has let a contract for 200 feet to Valentine & Co.

A contract has been let for driving a tunnel for development of the Indiana G. & S. M. & M. Co.'s group of claims on the north slope of McClellan mountain, near Silver Plume.

The Pioneer mine near Dumont has been pumped out and contracts let in the drifts and shaft. The shaft is down 200 feet below the tunnel level. Gasoline runs the hoisting engine and the mine is lighted by electricity. The same company works the Milton mine and the Pioneer mill. The Monarch tunnel being run to the Freeland mine, which it will cut at a depth of 2200 feet, will resume. It is in 2000 feet.

At the Gold Dirt, near Empire, connection with the upper levels is being made by an upraise from the sixth or tunnel level. The Surprise group on Clinton

and Silver mountains, recently sold to Nebraska men, is shipping smelting ore from an 8-inch shoot in the crosscut, giving values in gold and copper.

Lessee Parker, on the fourth level of the Little Mattie mine on Chicago creek, near Lamartine, reports a 2-foot shoot of smelting grade ore opened up. One shipment made gave returns of 8 ounces gold per ton.

Haggart & Riley have a lease on the Edgar lode on Democrat mountain, near Georgetown. Smith & Co., operating on the Konigshurg on Democrat mountain, are shipping ore.

CONEJOS COUNTY.

The Conejos County Oil Co. has bought 2000 acres of ground near La Jara and will drill for oil. W. D. Mielr of Denver is president.

CUSTER COUNTY.

At the P. & O. mine, near Silver Cliff, the shaft has been retimbered and enlarged to the 500-foot level. Drifts are being run on the vein from this level by two shifts. Assays show \$10 in gold. The owners of the Spring Hill mine expect to sink the shaft to the 800-foot level. It is down 100 feet.

The tunnel on the Powhattan, near Rosita, is down 910 feet.

EL PASO COUNTY.

(Special Correspondence).—The Telluride R. Co. began operating its 100-ton plant in June, 1902, and finds the use of bromine to be in every way satisfactory. The company is adding 200 tons to its plant, which will be in operation about May 1. This will make a total capacity of 300 tons per day.

Colorado Springs, Jan. 18.

From the coal mines north of Colorado Springs shipments are being made to Kansas, Nebraska and Iowa points. The Pike's Peak Co. is sending 300 tons daily and will increase to 500 tons. The Curtis Co. is also shipping.

FREMONT COUNTY.

The A., T. & S. Fe R. R. Co. have thirty men at work opening up a sandstone quarry for holding stone 1 mile east of the Portland cement works, near Florence.

The Rita Alto mine, near Hillside, is being developed by two tunnels, one 700 feet and the other 415 feet, each of which connects with a shaft 190 feet deep. H. L. Comstock is superintendent. At the Pac-tolus G. & C. Co. mine, of which H. L. Comstock is manager, an air shaft is being sunk to connect with a 500-foot tunnel that is being driven.

The millsite and concentrator of the Copper King G. M. Co. at Dawson was sold last week to T. S. Harris, of Canon City, by sheriff, to satisfy claims of men who built it, amounting to \$2500. The cost of the concentrator was \$16,000.

GILPIN COUNTY.

Most of the ore produced at the Gunnell and Grand Army mines, on Gunnell hill, near Central City, is being taken out by tributaries. The work is confined to the levels above the 1000-foot point, but work will be resumed in the lower levels next month. Shipments are being made from the Baby Ruth mine up Prosser gulch to the stamp mills. It is north of the Eureka shaft and operated by Allen & Co. of Central City.

At the International M. Co.'s P. K. mine on Silver gulch, near Black Hawk, men are straightening the shaft and sinking will resume next month. Eastern parties are working a group of twenty-four claims on Cyclops hill above the Hidden Treasure mill, which will be cut by the Reward and Alleghany tunnels. The Reward is in 150 feet.

Manager A. B. Drake of the Mingo G. M. Co. says the ore body was struck last week in the 300-foot level west of the Mingo mine in Lake district, showing 2 feet of concentrating ore and 12 inches of smelting grade carrying gray copper and lead ore.

The Helen G. M. & T. Co. have their tunnel on Colorado hill in Pine district in 275 feet.

Superintendent G. W. Mahee of the Butler Con. M. Co. on Gunnell hill says they will sink the shaft, now down 315 feet, another 100 feet. The shaft on the Belden mine in Chase gulch is being retimbered.

GUNNISON COUNTY.

In the Augusta mine at Pittsburg the tunnel at a depth of 1500 feet is in 2000 feet and is expected to cut the Augusta vein opened in the 320-foot tunnel which enters the mountain from the Dark canyon side. The upper tunnel is in 1200 feet. The last 100 feet of this tunnel is in a body of quartz carrying ruby silver and zinc blende and gold values. The Augusta Co. expects to complete the lower tunnel next month. A concentrating plant will

be erected and a 2-mile tram will connect the mine and the mill.

The Akron M. Co.'s tunnel under the May-Mazeppa and North Star ground in the Whitepine district is in 2725 feet and nearing the ore bodies opened in the upper workings which they expect to reach by April 1. The new shaft on the David H. is down 100 feet and they expect to cut ore at 125 feet.

The Good Hope mine at Vulcan is showing in the 500-foot level 3 feet of ore carrying tellurides and assaying \$500 gold. The shipments are forty tons per week.

The Headlight Co. at Spencer has its shaft down 100 feet and will continue.

LAKE COUNTY.

The Garibaldi tunnel at the head of California gulch near Leadville has resumed, under lease to J. Cooper.

The Walcott M. Co. has leased the Coronado property near Leadville to the Midas M. Co. This will give the Midas twenty acres further to the north. At the Best Friend, near Leadville, leased to McHale Bros., Lynch & Brooks, the tunnel now in 140 feet will cut the Doyle shaft 170 feet below its present bottom.

F. Lanphier & Co., operating the north end of the Fanny Rawlings claim near Leadville, have 2 feet of shipping ore in the shaft.

Superintendent J. Evans the New Home M. Co., Leadville, is shipping 100 tons per day of iron ore from the Penrose and doing development work.

Last week twelve hand roasters and another lead furnace were blown in at the Salida smelter at Leadville, giving it a capacity of 700 tons per day.

The Valentine workings are unwatered, it taking thirty days. The average flow of water raised was 1200 gallons per minute. Guides have been put into the shaft, a cage installed, and men are cutting a station at the 500 level for a compound pump.

The tunnel on the Best Friend is in 150 feet and another in 350 feet is expected to cut the Doyle vein. The tunnel will strike the shaft 170 feet below its present workings.

LA PLATA COUNTY.

The Bonnie Girl M. Co., near Durango, propose to install a cyanide plant.

OURAY COUNTY.

The Paymaster-Sylvanite M. & M. Co. is incorporated; H. Hobson, T. F. Nelson, A. B. Bradford and J. R. Farris, to operate in the Uncompahgre mining district.

PARK COUNTY.

Oil has appeared in the well of the Illinois-Colorado Oil, Gas & Coal Co., in South Park, at a depth of 125 feet.

During the past year 60,000 acres of oil lands were located in the South Park, around the Lone Tree spring, midway between Hartsel and Como, and in this section the first drilling experiments are being made. The People's Union Oil Co. of California and Chicago men has been organized to operate in South Park, and has 1000 acres of oil land.

SAN JUAN COUNTY.

(Special Correspondence).—The Sunny-side M. Co. has disposed of all its holdings to the Venture Corporation Co. of London. Stated price \$2,500,000.

Silverton, Jan. 22.

A. V. Shaw of Boston has a lease on the Boston-Auburn claims on Tower mountain near the summit on the Eureka gulch side, near Eureka. There are two tunnels and two shafts, making 400 feet of development.

SAN MIGUEL COUNTY.

The Liberty Bell's 50-stamp mill, one-half mile above Telluride, is crushing 300 tons of ore per twenty-four hours. The cyanide plant treats the tailings from the mill.

SUMMIT COUNTY.

The Puzzle M. & R. Co. of Breckenridge is putting a churn drill hole down from the shaft in Illinois gulch on the Puzzle Extension claim. The drill hole is to connect with an upraise driven from the Puzzle main tunnel. From the collar of the shaft to the tunnel level is 140 feet; the drill hole will drain the water from the shaft into the tunnel level, facilitating further development from the shaft, which is 110 feet deep. H. B. Achter is manager. The Mountain Pride is shipping 100 tons per month of ore and concentrates. It is a silver-lead ore carrying gold values.

The Nettle B at Kokomo, operated by P. Fisher, is shipping 500 tons per month of iron sulphide ore.

TELLER COUNTY.

Shipments from the Jerry Johnson, Cripple Creek district, amount to 130 tons a month, which average \$100. There are two sets of lessees. Welder & Co. are operating the Pullin shaft and are sinking

an additional 100 feet, which will give them a total of 1200 feet. They are stopping from the 300 level on a 4-foot vein that contains 2 feet of \$100 ore. Fogleman & Co. are operating through the Raine shaft. They are stopping in the 225-foot level and breaking 18 inches of \$100 ore; also drifting on this level.

Ardoll & Co., leasing on the main workings of the Dante, on Bull hill, Cripple Creek, are shipping a car a week of \$60 ore. The ground is being prospected at surface by other lessees.

Babbitt Bros., leasing on the Jenny Sample, on Raven hill, Cripple Creek, are shipping 100 tons a month of ore from the 200 foot level north of the shaft, and some from the 430-foot level.

H. P. Dahl has a lease on the Anaconda Co. mine, at Cripple Creek, in the lower workings. It is being worked through a winze, which is sunk 400 feet below the tunnel. The lease includes territory from 200-foot level of the winze down 300 feet. The top of the winze is at an elevation of 9500 feet above sea level, and the Cripple Creek drainage tunnel will cut the water at 8800 feet.

Work is resumed on the Amanda at Windy Point, near Cripple Creek.

Manager H. M. Risley of the Frank Burt M. & Co. on the north side of Iron mountain, 2 miles northeast of Cripple Creek, has the shaft down 60 feet and in ore carrying gray copper, copper glance and cuprite with gold. The shaft will be sunk another 100 feet. West of Iron Mountain the Denton G. M. Co., owned by Cleveland, O., men, is driving a tunnel on the Denton claim which in another 100 feet is expected to cut a vein opened up 200 feet higher up the hill assaying \$100.

Manager D. Hanley, the Cripple Creek Enterprise M. Co., mining under the streets of Cripple Creek, last week struck a flow of water in the shaft at 200 feet, and pumps are being put in. — Returns from the Whetstone lease on the Morning Glory claim of the Work Co. last week gave \$37 per ton for a 10-ton shipment, and \$31 per ton for a 25-ton lot.

A strike of gray copper ore has been made in the bottom of the winze 300 feet below the 900-foot level of the main shaft of the Rubie claim on Bull hill, near Cripple Creek.

A cyanide plant is being installed on the Adonis claim on Copper mountain, Cripple Creek district, under lease to the Sioux Falls & Cripple Creek G. M. Co. O. B. Finn is superintendent.

The Anaconda Co. at Cripple Creek has granted a lease to C. Crowder & Co. on blocks 25, 26, 27, 18 and 19, on the northeast slope of the Gold side. On account of bad air at face of the main tunnel the operators will drive one of the main laterals 400 feet to connect with the tunnel. From the Mercer lease on block 34, 100 tons of \$30 ore are shipped monthly.

Gilbert & Sayle, leasing on the LeClair on Gold hill, Cripple Creek district, have the shaft down 140 feet and will go to 400 feet.

The directors of the Stratton-Cripple Creek M. & D. Co. have decided it is impracticable to grant leases of the ground as it lies at present, as the claims are too large to be leased to any one person. All their territory will be surveyed and apportioned into blocks before any leases are considered. There have been received 600 applications for leases.

B. Fuller, leaser of the Gold Coin dump, is refitting the Beatty sampler, near Goldfield.

The Cripple Creek & Pueblo Ry. Co., which bought the Gold Exploitation tunnel (Ophella), which enters Gold hill from Cripple Creek, has begun operations. Manager Parfett says it is in 6000 feet, and after connections are made for air with some of the adjoining properties, they will drive ahead for 3 miles into Bull hill which it will cut at 1600 feet below the apex. The tunnel is equipped with an air compressor and other machinery, and it is expected to make 10 feet a day.

The Dan Hanley shaft of the Cripple Creek G. E. Co., near Cripple Creek, is down 200 feet and a station cut.

A washing machine has been put in at the Granite mine on Battle mountain, near Cripple Creek, to clean ore before it goes on the sorters' table. It has a capacity of 200 tons daily.

Sinking is resumed on the Zoe on Beacon hill, near Cripple Creek, by lessees Hanson & Best to go another 75 feet. The shaft is down 600 feet. This leasing company did not sink last year on account of water, but since the El Paso Co. has been pumping the water has receded in the Zoe ground.

IDAHO.

BOISE COUNTY.

The Lost Packer mine on Loon creek, owned by a New York company, has been tapped at a depth of 100 feet. The ledge is $4\frac{1}{2}$ feet wide and the ore runs \$37 in gold, says the Idaho World.

CUSTER COUNTY.

Two carloads of ore from the Ramshorn mine at Bay Horse, operated by lessees, were marketed last week.

IDAHO COUNTY.

The Lucky Lad and Alligator claims, north of the Big Buffalo, in Buffalo Hump district, are sold to G. L. Hedges of Seattle, Wash., for \$45,000. A tunnel will be driven.

Manager R. M. Sherman says the first week's run at the American Eagle 10-stamp mill, near Elk City, gave two gold bars worth \$3180. The ore crushed was from the three stopes of the upper tunnel. Twenty tons per day are crushed.

The Fortune mine in Buffalo Hump has been bonded to R. H. Hughes for \$55,000.

OWYHEE COUNTY.

At the Hoosier M. Co.'s group, near Silver City, two tunnels are being run, one on each side of Barnes' gulch, by Contractor J. Jensen; tunnel No. 7 on the east side 1500 feet and on the west side tunnel No. 3 of 700 feet.

SHOSHONE COUNTY.

On the Stewart property, near Government gulch, near Wardner, the prospect tunnel has cut a body of carbonate ore.

It is reported that mines in the Cœur d'Alene district have contracted to deliver 800,000 tons of lead ore to the Independent smelters during a period of five years.

WASHINGTON COUNTY.

Last week the smelter of the Boston & Seven Devils C. Co., on the Welser river, 8 miles from Welser, was sold to C. A. Ballerich of Denver, Colo., on a \$24,000 judgment for machinery furnished.

MICHIGAN.

HOUGHTON COUNTY.

The shaft on the Ahmeek mine, near Houghton, is down 100 feet. Sinking has been stopped and a Highland Jumper drill is prospecting from the bottom of the shaft. The property consists of 920 acres northwest of the Mohawk. The formation dips at 38° and the drill hole is expected to show up the Kearsarge lode.

The Quincy at Houghton will put in ten additional electric tramming locomotives. The experience of the past year with the four now in use on the forty-third, forty-sixth, forty-ninth and fifty-fifth levels, north of No. 6 shaft, has proven their economy. It is the intention of the management to do away with all hand tramming. They will install a 1200 H. P. electrical generating plant to furnish light for the mill and mine and power for the locomotives at the mill at Mason, where it has its fuel docks.

The steam cylinder and upright frames for the third head of the Trimountain mill, near Houghton, are being set up and the balance for the third and fourth heads have arrived. The plant is expected to be completed by March 1st. The Trimountain began stamping Jan. 3, 1902, with the leased Arcadian head. On Nov. 1 two heads in its own mill were stamping; 200,000 tons were crushed for the year.

The Calumet & Hecla, near Houghton, is stamping 6000 tons of rock daily.

The tailings are being worked over at the Franklin copper mine mill, and a concentrating plant for a similar purpose is being built at the Central mine.

MISSOURI.

JASPER COUNTY.

During the year 1902 there were slight changes in mining methods, and the general situation both as to mining and milling in the Joplin district shows but small variations from the practice of 1901. The only change in mining practice is the employment of heavier hoisting devices and buckets of larger capacity; 1000-pound buckets have been added to the new plants in place of the 500-pound buckets formerly used. This has necessitated heavier cables and stronger hoisting engines. The number of air drills used has increased during the year. Few mills have been built during the year, but a large number of old mills have been moved to new locations, and the number of operating mills is about the same as a year ago.

The production of spelter during the year 1902 is estimated by J. Struther, compiler of the spelter statistics for the U. S. Geological Survey, at 153,447 tons, or 17,595 tons greater than the production of the preceding year. The spelter production of the United States in 1891 was 80,873 tons; since then the production has been almost doubled, the actual increase since that year being 98%. From 1891 to 1897 the production did not exceed 81,499 tons. The following year the production was almost 100,000 tons, and since then the production has increased more than 50%.

MONTANA.

DEER LODGE COUNTY.

At the Atlantic Cable mine, at Cable, the shaft has been unwatered and development begun, with twenty men at work. At the head of Flint creek the Milwaukee G. E. Co. has twenty men at work on the Hannah claim. G. H. Savage is superintendent.

FERGUS COUNTY.

The capacity of the Kendall mill at Kendall will be increased by eight more tanks next month, which will make a daily output of 400 tons, says Superintendent H. Lang.

FLATHEAD COUNTY.

D. P. Bowers, manager of the Snowshoe, near Libby, owned by the Rustler M. Co. of Spokane, Wash., says that a strike of 2 feet of shipping galena has been made. "During the past year we have milled ore taken only from development in sinking the winze and in driving the drift, little stoping having been done. We sold \$60,000 worth of concentrates to the smelter. It cost \$26 per ton to get our ore treated, including hauling by team to Libby, giving net returns from the smelter of \$40,000. During the summer the mill was run but 125 shifts. We will increase the capacity of the mill to 300 tons a day, and put in additional power either with a flume or electric plant."

GRANITE COUNTY.

A strike is reported in the west 1700-foot level of the Bimetallie mine at Granite of ore assaying 1500 ounces silver. The ore carries ruby silver with native silver.

MADISON COUNTY.

Last week W. B. Millard bought of C. E. Damours one-sixth interest in the bond of the Kearsarge lode, near Virginia City, and his holdings in the Sparling properties, for \$2500. Millard also bought the interests of the Pomeys and the J. Hyde estate, making a total of \$10,000 involved. The Madisonian says in the Shenandoah mine, near Virginia City, owned by G. F. Weeks, an 18-inch shoot of gold ore has been opened, assaying \$75.

On the Easton and Pacific mines, near Virginia City, there are forty men at work.

The Kennett Co. last week shipped \$10,000 in gold bullion as a result of twenty days' run of the 5-stamp mill, working two-thirds of each day. The ore was from the Kearsarge mine at Summit, near Virginia City. R. B. Turner is superintendent.

PARK COUNTY.

Butte men have an option on the Yellowstone M. Co. mines in Bear gulch, adjoining the ground of the Bear Gulch M. Co., near Livingston.

SILVER BOW COUNTY.

For several months past the Anaconda Co. has been making an effort to solve the smoke problem in Butte, and scientific experiments have been in progress at the new smelters at Anaconda under the direction of Stuart Croisdale, of Colorado, and the construction of dust chambers and other additions to the smelting plant, which are expected to eliminate the smoke trouble, will soon be begun.

F. A. Heinze, as administrator of the estate of J. Larkin, has petitioned the court to lease to him the mining claims of the estate for 25% of the ore extracted.

President L. Mantle of the Butte M. & D. Co., operating the Emma in the southern part of Butte, says the crosscut at the 800 is in 485 feet, 150 feet of which is in the lead. One ore body cut is 5 feet wide and shows an average of twenty-five ounces silver, \$3 gold, 14% lead and 1% copper.

NEVADA.

DOUGLAS COUNTY.

E. W. Carmen, of Cleveland, O., has bought the Longfellow mine in Red Canyon district, half a mile from Bullionville, near Gardnerville, for \$3000. A mill will be built.

ELKO COUNTY.

The mines at Bull Run employ thirty-five men.

The Bull Run mine in Centennial district has been sold to H. P. Taylor, of Boise, Idaho, for \$150,000.

HUMBOLDT COUNTY.

(Special Correspondence.)—The California-Nevada M. Co. of Los Angeles, with mines at Lovelock, are developing an 8-foot vein in the Victor mine. The company is installing a mill furnished by John Wigmore & Sons Co., consisting of three Standard concentrators and a Sturtevant mill. More concentrators will be put in.

J. A. Lathrop of Boston, Mass., reports having an option on the Rye Patch mine, near Lovelock.

Lovelock, Jan. 20.

Diamond drills will be used by the

American Nickel Co. at their properties in the Cottonwood district in prospecting. G. W. Dunn is president.

LINCOLN COUNTY.

At the Demijohn mine, near Pioche, near the Half Moon, a raise hack of the shaft has been connected with the lower workings, showing up a body of lead-iron ore and providing a current of air.

C. O. Whittemore & Co., of Salt Lake City, Utah, have an option on the Mendha group at Highland district. In the lower workings the Navy drift shows 6 feet of gold ore.

The Keystone Co., with their Huntington mill at Sandy, is said to be netting \$10,000 per month.

Superintendent Drummond says the preliminary surface work, setting up machinery, etc., is completed and development begun in the Good Hope mine at Searchlight.

Mayhew, Alexander, Cohn and Miller are working on a contract for the Duplex Co. near Searchlight, running a 600-foot crosscut from the 500 level in the main shaft of the Searchlight to the New Year's Gift. The ore road to the mill is finished to the New Year's Gift shaft and will be continued to the Ella workings. A three-terrace tailings pond has been laid out below the mill.

Superintendent C. Gracey of the Wall Street mine at El Dorado Canyon has the shaft down 105 feet and in ore.

The tailings dump around the old De Lamar mill are yielding bullion returns of \$2.25 gold per ton, says Superintendent F. P. Janney. There are 700,000 tons in the dump and 200 tons are daily cyanided. On construction and underground there are 600 men at work.

At the Mendha, near Pioche, Superintendent T. J. Osborne is opening up the ledge, which averages \$30 in gold.

NYE COUNTY.

(Special Correspondence.)—The Montana-Tonopah has good milling ore on the dump and a new strike of high-grade ore is reported in their shaft at 450 feet. The Great Western shaft is down 110 feet with horse whim. The new hoist on the Hallfax is running. The shaft is down 320 feet. The California-Tonopah shaft is down 190 feet. Manager Sollender reports 30 feet of ore, 4 feet of which is shipping grade. The Fraction Co. are taking out ore from their new strike in No. 2 shaft. The Ohio-Tonopah shaft is down 465 feet.

On the Gold Hill they are cutting a station at the 300 level; when completed they will sink to 500 feet and connect with the Tonopah M. Co.

The Silver State shaft is down 575 feet. A strike was reported of 7 feet of \$60 ore. The Tonopah Midway Co. have begun sinking with their new steam hoist.

The King-Tonopah Co. (Lynch & O'Meara) are down 110 feet with a gasoline hoist. A strike is reported in the Wandering Boy shaft of the Tonopah & Salt Lake Co. The Tonopah Co. continues development work, but no stoping is going on.

The Mizpah Extension Co.'s shaft is down 612 feet. In sinking the sump for crosscuts the showing determined the management to crosscut at this level and continue sinking. They are coming into another ledge. The Osborne mill at Butler wells is running on Tonopah ores.

The Ray & O'Brien Co. at Ray are down 300 feet, with 2 to 4 feet of ore—some shipping.

The Silver King at Lone mountain is sinking on a vein 7 feet wide, of which 8 inches on the hanging wall goes \$6 per ton in silver; the balance of the vein goes \$8.

Tonopah, Jan. 19.

The Tonopah Cash Boy Co. is incorporated, J. D. Torreyson, L. A. Blakerley, A. G. Fletcher, H. J. Humphries, A. Wise, M. W. Smith, C. J. Young, J. G. McGuire, C. A. Clinton, T. R. Bannerman and J. Ryan, to operate properties joining the Tonopah, Little Tonopah and Golden Anchor, at Butler. The Giant Tonopah Co., 5 miles north of Butler, are taking out \$20 gold ore from their shaft, which is down 35 feet. Osborn's mill at Butler's wells is in operation. Ford & O'Neil, working a group of claims on Lone Mountain, have opened up a 4-foot ledge of galena running 20% lead, thirty ounces silver and a little gold.

At the Golden Anchor, at Tonopah, adjoining the Mizpah on the west, the shaft is down 110 feet, and in gray porphyry containing seams of quartz carrying values. The working shaft is 4 feet 4 inches square, with a 2 foot manway. Manager F. Ish, the North Star M. Co., says the main shaft is down 550 feet. The machinery for the hoist is on the ground. The Ohio-Tonopah shaft is down 475 feet and in the porphyry. A double-compartment shaft is being sunk by the Indiana-Tonopah on the Owl claim.

Sinking on the Molly Co. shaft, near Butler, is going down at the rate of 12

foot per shift. The shaft is double compartment, 10x4½ feet clear. The timbers are 8x8, and lagging 2x12.

The Tonopah Co., at Butler, is shipping 6000 sacks of ore monthly, which is being extracted in development work. Ore is being raised from the Silver Top shaft, at the southern opening of the company mines. The Desert Queen shaft last week cut seams of ore considered to show the proximity of the ledge. The Selbert shaft is 50 feet below the 500 station. The steam hoist at the Midway of the Midway-Tonopah Co. is in operation. At the Tonopah City, a steam hoist is being set up. At the McNamara, the boiler and hoisting engine are being put in place.

STOREY COUNTY.

The following is a report of the work at the mines of the Comstock at Virginia City for the week ending January 17th: Total extraction of ore for the week at the Con. Cal. & Virginia, nine cars, assaying on a basis of gold value \$52.88, and 161 cars assaying \$21.13 per ton. At the Ophir, 1900 level, the north drift from the fourteenth floor was driven from the north side of the slope 12 feet; total length, 50 feet; face in low-grade ore. The north drift from the sill floor was driven 17 feet; total length, 112 feet; face in hard porphyry and stringers of quartz. At the Hale & Norcross the tunnel was driven 13 feet; total length 3389 feet, with the face in diorite. At the Sierra Nevada, 1600 level, the north lateral drift started from the joint Sierra Nevada and Union west crosscut, 294 feet in, was driven 10 feet through porphyry and clay; total length, 58 feet. On the Best & Belcher, 200 level, the east crosscut No. 1 from the south drift was driven 20 feet; total length, 92 feet. The north drift from the raise was extended 11 feet through quartz; total length, 55 feet. The main south drift was extended 19 feet through low-grade ore; total length, 116 feet.

WASHOE COUNTY.

E. Olinghouse last week milled twenty tons of \$65 ore from his claims at Olinghouse. He has 100 tons on the dump valued at \$40 per ton. W. C. Williams' mill is running on ore from the Cabin and Gold Ledge.

NEW MEXICO.

COLFAX COUNTY.

The Confidence M. Co., at Elizabethtown, is crosscutting from the 400-foot level with three shifts.

The Baldy tunnel property of the G. & C. Deep Tunnel M. & M. Co. in Big Nigger gulch, near Elizabethtown, has put on another shift. The tunnel is in 820 feet and will be run 3600 feet in all, giving a depth of 2000 feet.

The Confidence M. Co. is crosscutting from the 400-foot level, with three shifts at work. The Bobtail-Senate mine will resume under new management.

GRANT COUNTY.

The tunnel on the Manhattan at Pinos Altos is being cleaned out preparatory to resuming.

G. Easton, leasing the Caldwell group at Burros, is shipping copper ore to the smelter. The Silver City smelter has been sold to the Comanche M. & S. Co., which will increase the capacity to 250 tons per month. R. H. Thompson has begun development work on the McKinley mine in the Burros district. He has put up a whim and is sinking. The McKinley adjoins the St. Louis of the Southwestern C. Co. C. P. McLaughlin is developing copper property at White-water in the Burros and putting in a steam hoist.

Operations have begun on the Hirschberger mine at Pinos Altos. J. L. Schofield & Co. have a bond on this property, consisting of the Eastern and Western, adjoining the Mountain Key mine. The Eastern is developed by four shafts from 40 to 160 feet deep which are in ore. There are four shafts on the Western, the main shaft being down 340 feet with 2000 feet of drifts and crosscuts. The lessees have erected a steam hoist and are unwatering the workings.

SAN JUAN COUNTY.

H. Towner and T. Bryan are reported to have a 30-foot vein of lignite coal on their claim near Fruitland.

SANTA FE COUNTY.

C. R. Galbrath and C. G. Warner of Franklin, Pa., have bought a group of claims at Cerrillos, including the Great Western, Robert G. Ingersoll, Sure Winner, Bertha Mable and Little Chief, for \$7000. They are interested in the smelter at Cerrillos.

SIERRA COUNTY.

C. H. Laidlaw has five men at work on the Black Knife group at Fairview. Men are working on the Dictator group

at Fairview, which is owned by Pittsburg, Pa., men.

The Prosper G. M. & M. Co., at Fairview, will put up a mill and hoist.

The Hillsboro G. M. & M. Co. has resumed at its mill in Ready Pay gulch on ore from the Ready Pay mine.

B. S. Phillips will move the Wing mill from Mineral creek to the Minnehaha mine at Fairview.

TAOS COUNTY.

The New Mexican says Cripple Creek parties will put in a dredger at Questa this spring.

OREGON.

BAKER COUNTY.

Manager P. R. Bishop of the Climax mine, near Sumpter, says he has finished sinking a 60-foot winze from the upper tunnel. An upraise being driven from the lower tunnel to meet it is up 50 feet, with 100 feet yet to go.

Manager Bellman says the aerial tramway at the California mine near Sumpter is in operation.

A. H. Willett, of Portland, has bonded the Hawkeye group, being the Hawkeye, Mikado, Bromo-Chloride and Modoc claims, near Quartzburg, for \$18,000.

W. W. Robbins, of the South Pole Con. M. Co. on Rock creek, 8 miles from Sumpter, says the tunnel is in 860 feet.

Manager A. B. Brown, the Yellow Daisy mine near Sumpter, says the adit tunnel is in 320 feet, following vein matter. This group of six claims is on Spokane mountain, across Clear creek from the Red Boy mine, and adjoins the Blue Bird on the southeast.

Twenty stamps are dropping in the mill of the North Pole Co., near Sumpter. There will be forty stamps in operation when the mill is completed. The California mine has temporarily closed down.

Superintendent Thorpe, the Blue Bird, near Sumpter, has men drifting from the crosscut on the second vein. Development has thus far been mostly on the third vein. The drift on the third vein has shown a series of faults.

GRANT COUNTY.

L. Steinmetzer has a contract for 80 feet of tunnel along the ledge at the Strassburg, near Alamo.

Sexton & Ward, at the Little Klondike at Quartzburg, have run a 50-foot tunnel and cut a 4 foot ledge of quartz containing galena and gold.

The George Washington mine, near Quartzburg, owned by Ward Brothers & Sexton, is being opened by a tunnel in 275 feet. On the Oakland there is one vein 3 feet wide and another one 20 feet, being opened up by two tunnels 300 and 325 feet in length. There are several open cuts and shafts on the veins.

JACKSON COUNTY.

The Maybelle mine of the White Cross M. Co., near Gold Hill, was sold by the sheriff last week to C. Wetherell on a judgment.

W. Nash has sold part of his mining ground in Grave Creek district to J. D. Heard, C. Strang, W. S. Jones and F. King, who will cut a ditch and begin development.

JOSEPHINE COUNTY.

The Gold Mining King group of claims, on Josephine creek, in western Josephine, has been bonded by M. Marks of Seattle, Wash., for \$10,000; he will put up a mill.

MALHEUR COUNTY.

Manager J. F. Meikle, of the Black Eagle M. Co., has the 20-stamp mill crushing ore from the porphyry dike, near Malheur.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Since Nov. 1, 1902, the capacity of the mines of this county has been increased to a total monthly tonnage of 51,300 tons, the last of the plants being completed this month. Following is a statement showing the monthly capacity of the several companies:

	Tons.
Horseshoe	30,000
Hidden Fortune	7,500
Penobscot	6,000
Hall & McConnell	1,800
Jupiter	4,500
Golden Crest	1,500

Total tonnage.....51,300
The 200-hp air compressor at the Ellison shaft of the Homestake M. Co., at Lead, is in operation.

The Pluma G. M. Co., near Lead, while excavating for the addition to the 40-stamp mill, struck ore of milling grade in two veins, aggregating 70 feet wide. The discovery is on the company's millsite of nine acres 4000 feet from the mine. The Pluma Co. controls the two veins cut for 900 feet on their strike. The main Pluma

shaft, in northeast Lead, is 410 feet deep, and in ore for 200 feet. On the 300 level a crosscut has been driven 150 feet west, opening up a body of milling ore. This crosscut is heading for the Hawkeye shaft, on ground bought by the Pluma Co.

The Columbus Con. M. Co. has completed the addition to its mill in Gayville, giving it a daily capacity of 100 tons.

TEXAS.

EL PASO COUNTY.

Last week at El Paso Chamberlain and Mote of San Pedro, Mexico, in the double-handed drilling contest for a purse of \$1000, made 43½ inches in fourteen minutes. The rock used was a block of Gunnison, Colo., granite. In the single-handed contest F. Yockey of Boulder, Colo., won by drilling 23½ inches in fifteen minutes.

UTAH.

C. DeMoisey, State Statistician, gives the following production of metals in Utah during 1902:

Silver, 15,173,204 ounces, at .5217 cents per ounce, \$7,915,338.83.

Gold, 193,865 ounces, \$20.67 per ounce, \$4,007,189.55.

Lead, 132,852,462 pounds, 4 cents per pound, \$5,314,098.48.

Copper, 26,824,153 pounds, 11.76 cents per pound, \$3,154,520.39.

During the year, 1883 men were employed in the mines, and \$5,025,500 in dividends were paid. After deducting for machinery and improvements, the net profit on all the mines in the State was 25%.

BEAVER COUNTY.

Four 34 H. P. gasoline hoists will be installed by the Majestic Co., at Milford, at the O. K., Harrington-Hickory, Vicksburg and Old Hickory.—At the O. K. a strike of sulphide ore is reported on the 200 level.—At the Vicksburg the new shaft is down 130 feet. At 250 feet a crosscut will be run to the vein.

In the Star district, near Milford, C. E. Rives has an option on the Beacon claim, at Shauntie, for \$12,000, to be paid in nine months. The property is ¼ mile from the Burning Moscow and is considered on the same ledge. Rives also has an option on the Anvil and Old Crow for \$12,000.—The Bluebird Co. has an option on the Hobson and Helen groups of eighteen claims, near the Copper King, for \$30,000.—The Majestic Co. has bought from D. Williams the Missionary claim, between the Old Hickory and Index groups, both of which are owned by the Majestic.

Fotheringham, McAulay & Lindsay, sinking a shaft on their group of claims southeast of the Majestic Co.'s Old Hickory, are down 70 feet in copper ore cut at 43 feet.

M. M. Jacobsen and F. Bettles, of the Cactus group near Frisco, report gray copper and chalcopryite in the west workings, assaying 20% copper, 25 ounces silver, and \$3 gold. The shaft has been unwatered.

GRAND COUNTY.

The Westwater Oil & A. Co. will install an asphaltum refinery of 100 tons capacity. The company owns 480 acres near Westwater, on which are deposits of crude asphaltum near the surface, which can be quarried.

IRON COUNTY.

The mines and mills of the Ophir M. Co. at Stateline are closed down.

JUAB COUNTY.

Ore is reported in the Early Harvest group at Fish Springs, in the Deep Creek district, assaying 156 ounces silver, 15% lead and 4.5% copper at a depth of 18 feet.

In the lowest workings on the Utah of Fish Springs, in the Deep Creek country, Superintendent C. Crismon says he has opened up ore that shows 446 ounces silver, with 30% lead.

The annual report of Secretary Bean to the shareholders of the Lower Mammoth Co. of Tintic showed that the company has sold during the fiscal year 3640 tons of ore averaging \$22.87 per ton. The gross receipts were \$83,258.25 and the disbursements \$76,698.66.

A body of sulphide ore carrying values in lead, silver and gold was opened in the Little Chief mine, Tintic district, last week, in a raise above the 800 level.

Manager C. E. Allen, the Centennial-Eureka, Tintic district, reports 225 tons of ore passing daily over the tramway to the furnaces of the United States smelter.

MILLARD COUNTY.

The Burns oil rig, near Deseret switch, has resumed and is down 1175 feet. It is intended to go 2000 or 3000 feet.

PIUTE COUNTY.

L. Nielsen & Co. will resume operations on the L. & N. group of fifteen claims on

the line separating the Baldy and Ohio mining districts, near Marysville. The lower tunnel is in 225 feet and is expected to cut the ore body at 500 feet. At one point a shaft has been sunk in ore giving assays of \$10 gold and silver. East of the L. & N. is the Elephant group, with the Wedge adjoining. P. A. Franklin has bought the Mountain Queen from Reynolds, Lyon & Balor. He also owns the Mount Baldy group of thirty claims and has an option on the Wedge.

SALT LAKE COUNTY.

At 4200 feet the Franklin tunnel, near Bingham, has cut the Silver Shield vein, reports Manager Joseph. It is 5 feet between walls, shows two streaks of ore.

The Cottonwood tunnel (Bingham and Eastern group), following the Jersey Blue fissure, near Bingham, is in 1920 feet. According to survey, at 1945 feet it will cut the IXL vein.

The lower or main tunnel of the Boston Con. of Bingham has cut through an ore-bearing zone 80 feet between walls and is going ahead for the main ore bodies. This ore carries iron sulphides, with values in copper, gold and silver. The chute was cut at 1000 feet on the dip of the vein.

At the Commercial group, near Bingham, the lead fissure has been opened up for 55 feet along its strike, the ledge being 4 feet wide, and has been raised on for 15 feet. From the Commercial 225 tons of sulphide ore are taken out daily and at the Dalton & Lark seventy-five tons. The main drain tunnel on the Dalton & Lark group is in 5200 feet and 400 gallons of water per minute are coming out at the opening.

It is reported the Pioneer sampler at Sandy is to be repaired and operated by a company, of which L. O. Jensen is manager.

Superintendent W. H. Nutting of the Bingham Con. Co.'s furnaces at Bingham says, with reinforcements that recent changes have provided, a reduction of 3 mills per pound is made in the cost of producing bullion. At present 500 tons of ore daily are being treated with three furnaces.

SEVIER COUNTY.

The lower tunnel of the B. W. & H. mine, in Henry district near Richfield, has tapped a 3-foot vein of shipping ore which is being sacked.

SUMMIT COUNTY.

Manager Lawrence of the Scottish Chief mine, above Park City, says he is shipping ore to the smelter assaying 40% lead, thirty ounces silver and \$2 gold.

Foreman Getsch, at the California mine at Park City, says the lower tunnel is in 1630 feet, the shaft is down 100 feet, and as soon as the tunnel level is reached (180 feet) the company will put up hoisting works and continue sinking to 500 feet. The vein in the upper workings is 60 feet wide, which averages half ore and half shale.

The tunnel at the Park City and Mid-night Sun mines in Iron canyon, near Park City, is in 450 feet, and is thought to be on the contact.

The shaft at the American Flag, near Park City, Superintendent Rhodin says is down 220 feet.

Manager A. L. Dickerman has the zinc plant at Park City in operation.

Manager Sappington, the Superiormine near Park City, reports a strike of silver-lead ore at 1350 feet in the tunnel, the values occurring in black manganese oxide. The company has nine patented claims in Bonanza Flat.

TOOELE COUNTY.

The Sacramento M. Co., at Mercur, has built furnaces for the reduction of the cinnabar in their ores. These ores have long been recognized as gold ores, with cinnabar as an accompaniment, and have been successfully worked by the cyanide process. The Sacramento is the first mine of the Camp Floyd group producing cinnabar in commercially profitable quantity.

UTAH COUNTY.

Elaterite (mineral wax) is reported by the Utah Shale Co. from their camp at Tucker. This hydrocarbon was found in a fissure cutting across the main deposit of shale, in which the men have been working preparatory to the setting up of the retort. The material is used for varnishes, insulation, etc. Manager Hague will exploit the deposit.

WASHINGTON.

FERRY COUNTY.

Superintendent Delbridge, the California mine, near Republic, says since July 15, 1902, in addition to the lead and copper, the mine has produced 3670 ounces of gold and 4650 ounces of silver, value \$75,000.

At the Belcher, on Upper Lambert Creek near Republic, two men are drifting on the vein, which carries \$32 gold. This

ore is practically self-fluxing. Contractor E. H. Clark is driving the tunnel ahead at 3 feet per day and is in 250 feet. At the Hawkoye copper mine, a mile west of the Belcher, the incline shaft 240 feet deep is being unwatered.

J. F. Lansing has a bond on the Blue Horse mine on Iron mountain, near Republic, and is sinking the shaft to 150 feet.

STEVENS COUNTY.

The Jefferson Marble Co. on Clugston creek, near Colville, is shipping its product to Chicago. The Crystal Marble Co. is also cutting and shipping material.

WYOMING.

During the last two years there were filed with the Secretary of State 339 mining corporation papers.

CARBON COUNTY.

The Verda Lode and Verde Lode Nos. 1, 2, 3 and 4, near Riverside, in the Douglas Creek mining district, have been sold to the Verda Con. Co. for \$100,000.

CROOK COUNTY.

The coal fields 10 miles west of Sundance, between Beaver and Inyan creeks, are to be opened up by the Black Hills Syndicate; and a railroad will be built to connect with the Burlington at Upton and at Spearfish, S. D., and with the Elkhorn at Bellefourche, S. D. C. Twombly is manager.

SHERIDAN COUNTY.

A strike is reported from the headwaters of Big Goose creek, near Sheridan, by C. W. Noyes and J. D. Watts. Their analyses shows uranium, gold, nickel and platinum.

UINTA COUNTY.

The Michigan-Wyoming Oil Co. at Spring Valley have resumed.—The Carter Co. are drilling.—The Atlantic & Pacific Co. is drilling on Section 24, Spring Valley. The first well is capped, all the tankage being full.—The American Con. O. Co. has resumed drilling on Section 34, and is now down 1080 feet and in the oil sand.

FOREIGN.

AFRICA.

GOLD COAST.

According to the recently issued colonial office report, gold is widely diffused throughout the colony, Ashanti and the northern territories, in quartz and alluvial deposits, while in Wassau there is gold-bearing conglomerate (bancet). The lack of good roads and means of transporting heavy machinery has proved an obstacle to successful mining on a large scale in the past, but the mining enterprise is resulting in improvement in the road system, and the Sekondi-Kumasi Railway overcomes the difficulty of transport to the Wassau district. The following table shows the amount of gold exported in 1901 and in each of the four previous years: 1897, 23,544 ounces (£84,797); 1898, 17,732 ounces (£63,838); 1899, 14,249 ounces (£51,300); 1900, 10,557 ounces (£38,007); 1901, 6162 ounces (£22,187). During the year 2825 concessions were filed in the colony, forty-one orders for survey were issued and two certificates of validity. Thirty-two prospecting licenses were issued and five prospecting licenses were converted into mining licenses. The number of surveyors' licenses issued was forty-four.

The population of the colony and Ashanti taken during the year was found to be 1,486,433, exclusive of the northern territories. The public health for the year was bad both in the European and native communities. Fifteen officials died during the year of a total of 188 and eighteen were invalided. Thirty-eight non-officials died and fifty-nine were, it is estimated, invalided.

SOUTH AFRICA.

For four months in succession the management at the Wolhuter has made a record in incline shaft sinking on the Rand, says the Johannesburg Star. The depth sunk, cleared and timbered was 209 feet. Between August and November the rate of progress has been advanced by nearly 30 feet, or nearly 17%. The work has been done entirely by white labor on contract, the men employed comprising skilled men and unskilled white helpers. The record of feet attained for the four months is: August 179 feet, September 182 feet, October 204 feet, November 209 feet. The shaft is in the eastern deep level section of the property and had reached a total depth at the end of November of over 1500 feet.

AUSTRALIA.

WEST AUSTRALIA.

The gold exported from West Australia and received at the Mint during December amounted to 189,755 ounces, valued, after refinement of the Mint's

portion, at \$692,605. The total production for the year ending December 31st amounted to 2,177,441 ounces, as compared with 1,879,390 ounces last year and 1,580,950 ounces the year before. The total yield since 1886 amounts to 11,982,049 ounces, valued at £37,670,371.

A gold rush to the newly discovered reefs at Bumbaldry, near Cowra, is in progress. The main line of reefs has been opened by trenches for 4 miles and is gold bearing all the way. A company has been formed to erect a mill. Some of the ore is rich.

The Golden Fleece mine, at Wyalong, is yielding rich pyritous ore. The Ali Nations mine is yielding 24-ounce ore and Neeld's mine 5-ounce ore. Two hundred and thirteen tons of ore crushed at Sully & Co.'s works for a number of small claim holders returned 670 ounces gold. A number of new mines are being opened on the field, and some Charters Towers men have two large leases adjoining the Neeld's mine and propose sinking to strike the reefs on the underlie. It is estimated that the shafts will have to be sunk to a depth of 4000 feet before the first reef is met.

BRITISH COLUMBIA.

Statistics of Provincial Government Office, Grand Forks, for calendar year 1902:

	No.	Revenue.
Free miners certificates.....	427	\$2,070 25
Companies' certificates.....	3	300 00
Special certificates.....	6	90 00
Certificates of work.....	580	1,510 00
Records of location of mineral claims.....	177	442 50
Conveyances.....	137	360 20
Certificates of improvements.....	51	127 50
Permission to relocate.....	1	12 50
Filings.....	70	17 50
Water rights.....	2	46 50
Miscellaneous receipts.....		308 30
Fees for crown grants passed through office.....		1,275 00
Total.....		\$6,560 25

The Blue Jay property, in Skylark camp, is negotiated for a working bond and lease for \$10,000. It is 1½ mile from Phoenix, on the same ridge with the Old Ironsides and Knob Hill mines. According to the terms of the lease, work on the Blue Jay must be continuous. It has a shaft 115 feet sunk on the ledge, and another shaft 40 feet in depth. A tunnel to tap the main shaft at a depth of 75 feet is now in 60 feet.

The Montreal & Boston Copper Co. will put in a converter at its smelter at Boundary Falls. Its second furnace will be running as soon as the blower has been received and put in place.

An electric hoist is being put in at the Snowshoe, the first electric hoist to be placed in Boundary district. Last week the Snowshoe sent out 1440 tons to the smelters. The last record was 1400 tons in one week in December.

On Saturday, the 17th inst., the Granby smelter blew in two furnaces, after a short shutdown on account of fire in the power and blower house. But for shortage of coke all four furnaces would be running. Two new furnaces will be put in, the full equipment to be completed by March, 1904. The week before last four furnaces treated 10,115 tons of ore at a cost, including freight and commission, of \$2.65 per ton. The management says it expects to reduce this to \$2.50. The company is putting in a 60-drill compressor. G. M. Luther is general manager.

The ore shipments from the Nelson division in 1902 amounted to 70,000 tons, as against 109,226 tons for 1901. This is valued at \$580,000, or about one-half of that credited this division by the Provincial Mineralogist for 1901. The drop in silver, copper and lead is responsible, and many properties have been compelled to close down or worked intermittently. The Ymir mine output was 50,000 tons, of a gross value of \$340,000. About 3400 tons of concentrates were shipped, the average value being \$30.

Ore is being broken in the stopes of the second and third levels of No. 1 mine of Le Roi No. 2. In the Josie the work of undercutting the ore bodies cut off by the dike is in progress.

The Homestake mine, near Rossland, has resumed shipping, sending out three cars last week. It is the first ore shipped from the south belt of Rossland camp for eighteen months, says the Spokesman-Review.

Several Chinese companies are working the head of Wild Horse creek, near Fort Steele, East Kootenay district, some putting in wing dams. One will use the headrock flume near the mouth of Brewery creek. On Weaver creek T. Roberts has a shaft down 90 feet and is drifting to the rim; a water wheel has been put in to hoist gravel and water. At Perry creek Thompson & Co. are drifting on bedrock, two being run up the creek, carrying a

breast of 20 feet, and one down creek with a breast of 12 feet.

The official statistics of the Kettle River mining division for 1902 are: Free miners' certificates, 741; free miners' special, 4; locations, mineral, 324; locations, placer, 11; certificates of work, 807; abandonments, 6; certificates of improvements, 60; conveyances, 235; placer leases, 2.

Lessee B. C. Longley shipped a car of ore to the smelter last week from the Non Such claim near Boundary Falls. The Non Such is a group of four claims owned by the Republic M. Co., of Spokane. The Republic and Last Chance are opened by 100-foot shafts on the vein, and the Non Such by tunnels. The ore carries gold and silver.

The Lanyon Zinc Co. propose building a sampler and roasting plant at Kaslo.

The Le Roi No. 2 at Rossland earned profits of \$45,000 in December. The statement of shipments and profits for the Le Roi for the last eight months of 1902 is as follows:

Month.	Tons.	Profits.
May.....	13,047	\$ 66,932.53
June.....	11,475	72,640.24
July.....	14,492	92,898.42
August.....	17,009	71,270.53
September.....	13,667	61,091.49
October.....	15,204	84,232.49
November.....	15,576	76,482.63
December (estimated).....	13,500	45,000.00

Total..... \$570,548.33

The Phoenix Pioneer gives the following estimate of output of the province for 1902:

District.	Value.
Boundary.....	\$ 3,030,000
Rossland.....	4,381,000
Nelson.....	580,000
Slocan and Slocan lake, Lardeau and Trout lake.....	1,425,000
East Kootenay.....	250,000
Yale and Similkameen.....	100,000
Cariboo, Cassiar, Lillooet and Vancouver island.....	1,750,000

Total, metalliferous mines..... \$11,516,000
Coal and coke..... 6,500,000

Total..... \$18,016,000

JAPAN.

Manager K. Yamaguchi, the Furukawa Central mines, 70 miles from Tokio, says the company works in mines, smelters and offices 20,000 men. All are Japanese. Wages are 40 cents to 70 cents per diem, which is two or three times the amount paid for other classes of labor in Japan. They use, he says, machine drills for breaking ore, and electric engines on the horizontal workings. The deepest workings are down 1200 feet. They produce 1,500,000 pounds of copper monthly. The ore averages 4% copper with a small percentage of silver. It is concentrated to 15% copper and smelted by the company.

KLONDIKE.

The Munger quartz mill is in operation at Dawson, under the supervision of the government. Rock from W. Fester's claim, of the Dawson City group back of Dawson, was first crushed.

MEXICO.

CHIHUAHUA.

A 100-ton amalgamation plant and an aerial tramway are being installed on the Adela mine in the Azules (Santa Barbara district). Manager W. A. Petit says the ore runs 50 ounces silver and 1½ ounce gold.

COAHUILA.

The company of Texas men operating the Reforma mines in Madaquena mountain near Sabinas Hidalgo, will build a \$30,000 concentrating mill.

DURANGO.

The Guggenheim Exploration Co. is reported to have secured options on the Avino mines near Durango, for \$6,000,000.

GUANAJUATO.

Manager J. T. Judd, the Bolanitos mines, 8 miles from Guanajuato, says on the 120 level from the new shaft 5 feet of ore has been struck, which carries \$7 per ton gold and silver. The ore body has been followed for 50 feet. The Bolanitos is on the La Luz system of veins. Another shaft at a depth of 140 feet has an ore body 30 feet wide, which averages \$10 gold. The company propose to build a 250-ton cyanide mill. Some ore is being shipped. The deepest workings are 800 feet.

NUEVA LEON.

The Monterey News says Manager E. D. Self, the San Carlos mine, will resume operations at the smelter at San Carlos next month.

SONORA.

The El Tigre mine, southeast of Douglas, near the Pilares de Teras silver mines, were bonded recently to Philadelphia men

for \$500,000. The Sonora River Placer M. Co., in the same district, is putting in machinery. R. O. Munson, manager, says sluicing will begin Feb. 1.

The San Diego mine in Altar district is sold to T. W. Carter and the first payment of \$20,000 made.

TASMANIA.

From the Shepherd & Murphy mine concentrates containing wolfram, tin and bismuth have recently been treated magnetically to extract the wolfram. The treatment was reported successful.

A lode 4 feet 6 inches thick has been cut at the 200 level by the Volunteer Co. at Mathinna. The company had done considerable exploration work before it met with success.

PERSONAL.

B. JAMISON is superintendent Carlsbad mine, Tintic, Utah.

J. A. WALL, owning mines in Mariposa county, Cal., is in San Francisco, Cal.

W. J. NELSON, a mining man of San Andreas, Cal., is in San Francisco, Cal.

F. DAVIS AND L. W. TATUM of Chicago, Ill., are examining mines in Mexico.

C. E. WHITEFORD is superintendent Norwegian Con. M. Co., near Tuttle town, Cal.

J. HOBBS is superintendent the Red Rock mine at Big Bug, Yavapai county, Ariz.

W. H. WOOD has resigned as superintendent Colorado Co.'s mine at Butte, Mont.

P. A. DWYER is manager Hewitt mine, near Sandon, B. C., vice C. T. Cross, resigned.

W. R. WING of Oakland, Cal., has opened a general assaying office in Gold Hill, Or.

T. CLARK, superintendent River Hill mine, near Placerville, Cal., is in San Francisco, Cal.

T. H. FULLEN, superintendent Angels Quartz M. Co., Angels, Cal., is in San Francisco, Cal.

R. WHINNERAH, former manager Humphrey mill, Creede, Colo., is in Indianapolis, Ind.

W. W. EMMETT, of Wall Street, Colo., is superintendent the Freedmen mine, Central City, Colo.

H. W. TURNER, superintendent the Cherry Hill mine, Siskiyou Co., Cal., is in San Francisco, Cal.

PRESIDENT E. L. WHITE of the Bingham Con. M. Co., is at Bingham, Utah, from Boston, Mass.

W. BALL is superintendent of the Lower Mammoth at Tintic, Utah, under the new management.

E. R. ABADIE, superintendent Champion mine, Nevada City, Cal., is in San Francisco, Cal., this week.

J. CHIPMAN is president and manager Lower Mammoth M. Co., at Tintic, Utah, vice S. Bamberger, resigned.

C. E. STOEHR succeeds J. R. Christie as manager of the Bull-Domingo mine, near Silver Cliff, Custer Co., Colo.

W. L. WATTS of Los Angeles, Cal., has gone to Santa Barbara county, Cal., to investigate the new oil fields there.

F. B. CALHOUN, until recently chief amalgamator of the Alaska-Treadwell mine, Alaska, is in San Francisco, Cal.

C. E. KNOX, manager Montana-Tonopah M. Co.'s mines at Tonopah, Nev., returned last week from Philadelphia, Pa.

F. L. SIZER has accepted the position of consulting engineer to the Argo M. Co., 26 miles from Helena, Mont., shipping copper ore.

H. H. NICHOLSON, M. E., of Denver, Colo., has been looking over the Sumpter, Or., mining district in the interest of Eastern investors.

GEO. W. SNEIDER, E. M., a graduate of the Golden, Colo., School of Mines, has been appointed Deputy State Commissioner of Mines of Colorado.

D. A. LYON, formerly of the University of Washington, is at Stanford, Cal., to take up the work in metallurgy formerly conducted by Prof. Newsum.

BULKLEY WELLS, of Boston, Mass., has been appointed manager and O. B. Kemp superintendent of the Smuggler-Union mines at Telluride, Colo.

GEO. A. ANDERSON, general manager Gold & Silver Extraction Co., Denver,

Colo., is in Scotland on business connected with the company.

A. J. PIKE, millwright and assayer, is superintending construction of a mill at the Ellwilda mines on Whiskey creek, near Grant's Pass, Or.

WM. H. KRITZER, E. E., is in San Francisco, Cal., to assist in the electrical and gas engine department of the Joshua Hendy Machine Works.

D. R. WILLIAMS has resigned as superintendent the Carisa mine, Tintic, Utah, to accept the superintendency of the McCabe mine near Prescott, Ariz.

E. C. LIMBACH of Denver, Colo., has returned from Chihuahua, Mexico, to take a position with a mining company at Maiden, Mont., to do cyanide work.

C. W. MERRILL, who has been at Lead City, South Dakota, for the past three years in charge of construction and operation of the large cyanide plants of the Homestake Co., is in San Francisco, Cal.

J. F. NEWSOM, associate professor of mining and metallurgy at Stanford University, Palo Alto, Cal., has returned from a tour of Europe, where he has been investigating the principal mining schools.

Commercial Paragraphs.

THE meeting of the board of directors of the Allis-Chalmers Co., held Jan. 15, declared regular quarterly dividend on preferred stock.

FAIRBANKS, MORSE & Co., Denver, Colo., has orders for two 60 H. P. gasoline engines for B. F. Morley, Buena Vista, Colo., two 34 H. P. compressor plants for Idaho Springs, Colo.

THE Gutta Percha & Rubber Mfg. Co. of San Francisco, Cal., report a pressure of orders for their lines, "Spadone" concentrator belts, hose, belting, etc., that requires their utmost exertions to meet.

MESSRS. BETHUNE & TRUAX, assayers and analytical chemists of Los Angeles, Cal., have removed their offices to 115 1/2 N. Main street, where they have opened a school of assaying, Mr. Bethune being a teacher in that line.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., makers of electric cranes and hoists, advise that "condition of business during 1902 was better than during any other year since they started business in 1884. Their crane orders for 1902 averaged at the rate of one for each working day, or 300 in all." Among the representative companies that are purchasers of cranes made by Pawling & Harnischfeger are the following, to which names are added the number of cranes purchased: Allis-Chalmers Co., 71; The Midvale Steel Co., 43; American Bridge Co., 30; Baldwin Locomotive Interests, 30; New York Shipbuilding Co., 16; United States Government, 10; Pennsylvania Railroad Co., 8; Bethlehem Steel Co., 7.

Catalogues Received.

Bound in red and bound to be read is the latest catalogue (No. 12) of the Joshua Hendy Machine Works of San Francisco, Cal., which treats on mining and milling machinery for operating and developing gold mines. The illustrations would do credit to a first-class magazine, and the description of the different devices is clear and concise.

The Mine & Smelter Supply Co. of Denver, Colo., have issued catalogue No. 16. It is descriptive of mining machinery of such description as almost every mine requires and includes several types of hoists, station and sinking pumps, compressors, boilers, water heaters and engines, skips, cages, cars and drilling machinery, as well as a variety of tools. It gives sizes and weights and much valuable information concerning the various devices illustrated in the book.

Books Received.

"Production and Properties of Zinc," is the title of a new work on this subject, by Walter R. Ingalls. It is a carefully written and illustrated treatise on the occurrence and distribution of zinc ore, the technical and commercial conditions affecting the production of spelter, its chemical and physical properties and uses in the arts. It presents a comprehensive view of the world's resources of zinc ores,

as far as known; 328 pages, 66 figures; \$3 net. The Engineering and Mining Journal, New York City.

Obituary.

D. B. LYMAN, a well-known mining man and former superintendent Con. Virginia mine on the Comstock, Virginia City, Nev., died at Reno, Nev., on the 16th inst., of pneumonia. He was a native of Vermont, aged 67.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JANUARY 13, 1903.

- 718,300.—RULE—M. G. Bailey, San Jose, Cal.
718,361.—DENTAL ENGINE—C. R. Basford, S. F.
718,375.—KILN—C. S. Batchelder, Spokane, Wash.
718,418.—GARMENT SUPPORTER—B'com & Menor, Seattle, Wash.
718,308.—FRUIT PACKING APPARATUS—Braun & Scott, Cupertino, Cal.
718,319.—CREAM SEPARATOR—J. G. Cunningham, Bellavista, Cal.
718,108.—MANIFOLD BOOK—G. B. Doyle, Berkeley, Cal.
718,454.—BURGLAR ALARM—Handy & Hosford, S. F.
718,280.—BAKE OVEN—P. E. Laskowski, Los Angeles, Cal.
718,264.—TELEPHONE MOUTHPIECE—J. F. Logue, Sacramento, Cal.
718,364.—SWITCH—J. P. Lowe, Seattle, Wash.
718,505.—TYPE WRITER—P. F. Nilson, Jerome, Ariz.
718,276.—DREDGER—R. A. Perry, Oakland, Cal.
718,278.—GARMENT SUPPORTER—E. L. Pitts, Jerome, Ariz.
718,525.—MARINE BOILER—A. E. Roberts, S. F.
718,164.—SCAFFOLD—M. S. Smith, Tacoma, Wash.
718,167.—MERCURY TEST GAUGE—Spencer & Fisher, S. F.
718,290.—GAME BOARD—N. B. Stone, Outlook, Wash.
718,232.—WOOL SCOURER—F. L. Whitney, S. F.
718,233.—RAILWAY SIGNAL—J. W. Williams, Spokane, Wash.
718,460.—FLUSHING TANK—W. A. Williams, S. F.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

DREDGES.—No. 718,276, Jan. 13, 1903. R. A. Perry, Oakland, Cal. The object of this invention is to construct the dredging apparatus, and especially the supporting ladder, that it may be attached to the hull of an ordinary vessel without material change therein, said apparatus projecting so far from the front of the vessel that it can cut a channel through which the vessel may float. The main engines of the vessel may have the shaft provided with couplings and located in line between a propeller shaft and the shaft of the suction pump, so that by disconnecting one set of couplings and connecting the other the suction apparatus may be operated when it is desired to move the vessel from place to place. In conjunction with these devices I have shown a crane and mechanism by which the ladder and dredging mechanism may be lifted and sustained in such position as not to interfere with the movements of the vessel when traveling. This invention reduces the cost and also simplifies construction as hitherto used in dredgers.

ATTACHMENT FOR TELEPHONE MOUTHPIECE.—No. 718,264, Jan. 13, 1903. J. F. Logue, Sacramento, Cal. The object of this invention is to provide a simple means of preventing the transmission of disease germs through the medium of the usually unprotected mouthpiece. It consists in the combination with a telephone mouthpiece of a wire frame secured thereto and said frame comprising a single piece of wire centrally bent to form a loop embracing the mouthpiece, but out of contact therewith and approximately in the same plane with the open end of the mouthpiece and the portions of said wire intermediate of said loop and its point of connection with the mouthpiece bent to form a support for a sheet of paper.

FRUIT PACKING APPARATUS.—No. 718,308, Jan. 13, 1903. C. A. Braun and W. M. Scott, Cupertino, Cal. This invention is designed to provide a simple means for packing and pressing dried prunes, figs, raisins and other fruits uniformly and expeditiously into small packages or cartons preparatory for shipment. It consists in the combination in a packing apparatus of a supporting frame, forms thereon, holders fitting said forms and adapted to have a sheet forced thereover, a shield fitting over the end of said holder and protecting the sheet, said shield open along one side, plungers by which the fruit may be compressed in the holders, and clamps upon said frame in which a package may be held after the holder is withdrawn and while the open end of the sheet is being folded.

CREAM AND BUTTER SEPARATOR.—No. 718,319, Jan. 13, 1903. J. G. Cunningham, Bellavista, Cal. This invention consists of a support or base including a bracket having a tubular portion provided at its upper end with a stuffing box, and having a shoulder 14. A receptacle is provided having a central opening in its bottom and having a sleeve 6 and an annular flange adapted to rest upon said shoulder, with means for detachably coupling the said sleeve to the bracket, and a vertical shaft extending through the tubular portion of the bracket, and having, at its upper end, an enlarged head adapted to rest upon the top of the said tubular portion. A vertical hollow stem open at both ends is provided with flanges on the lower part of the stem and radial blades fixed between said flanges, said stem having perforations between said blades, means for rotating the shaft, and vertically disposed, perforated baffles on the stem and also fixed to the receptacle.

Latest Market Reports.

SAN FRANCISCO, Jan. 23, 1903.

METALS.

SILVER.—Per oz., Troy: London, 21 3/4 (standard ounce, 925 fine); New York, bar silver, 47 1/2; refined (1000 fine): San Francisco, 47 1/2; Mexican dollars, 38 @ 39c San Francisco, 37 1/2 New York.

COPPER.—New York: Standard, \$11.62; Lake, 1 to 3 casks, \$12.15; carload lots, \$12.00; Electrolytic, 1 to 3 casks, \$12.05; carload lots, \$12.25; Casting, 1 to 3 casks, \$12.00; carload lots, \$11.10. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £52 13s 9d spot per ton.

LEAD.—New York, \$4.12; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4 1/2 1000 to 4000 lbs.; pipe 5 1/2, sheet 6, bar 5 1/2; pig, \$4.75. London: £11 11s 3d per ton.

SPELTER.—New York, \$4.05; St. Louis, \$4.50; London, £20 6s 6d per ton; San Francisco, ton lots, 6 1/2; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9 1/2; Hallett's, 8 1/2; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$28.00 @ 28.25; San Francisco, ton lots, 30c; 500 lbs., 30c; 200 lbs., 30 1/2; less, 31c; bar tin, 3 1/2, 35c. London, £128 5s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19 oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.50; large lots; London, £8 15s; San Francisco, local, \$45 50 @ flask of 7 1/2 lbs.: Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 1/2c; extra, 17 1/2c; genuine, 35c; Eclipse, 37 1/2c.

ALUMINUM.—New York, No. 1, 99 1/2 pure ingots, 35c; No. 2, 90 1/2, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 19 1/2c; San Francisco, Plumbers', 100-lb. lots, 16 1/2c.

NICKEL.—New York, 50 @ 60c @ 7c; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.00; gray forge, \$20.15; San Francisco, bar, 3c @ 4c, 3 1/2c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$28.00 @ 30.00; open hearth billets, \$30.50 @ 34.00; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$25.00 @ 25.50
Foundry Northern 1.....	23.50 @ 24.00
Northern 2.....	23.00 @ 23.50
Northern 3.....	22.50 @ 23.00
Southern 1.....	23.85 @ 24.85
Southern 2.....	23.35 @ 24.35
Southern 3.....	22.85 @ 23.85
Forge.....	22.35 @ 23.35
Charcoal.....	25.50 @ 26.50
Billets, Bessemer.....	33.00 @ 34.00
Bars, iron.....	1.80 @ 1.85
Bars, steel.....	1.75 @ 1.80
Rails, standard.....	28.00 @ 30.00
Rails, light.....	34.00 @ 40.00
Plates, boiler.....	1.90 @ 2.00
Tank.....	1.75 @ 1.80
Sheets, 26 store.....	2.90 @ 3.00
No. 27.....	3.00 @ 3.10
No. 28.....	3.10 @ 3.20
Angles.....	1.75 @ 1.80
Beams.....	1.75 @ 1.85
Tees.....	1.80 @ 2.00
Zees.....	1.75 @ 2.25
Channels.....	1.75 @ 2.25
Steel melting scrap.....	18.25 @ 18.50
No. 1 railroad wrought.....	18.50 @ 19.00
No. 1 cast, net ton.....	17.50 @ 18.00
Iron rails.....	24.00 @ 25.00
Car wheels.....	23.00 @ 23.50
Cast borings.....	10.25 @ 11.50
Turnings.....	14.00 @ 14.50

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILES.—Per keg (list prices): No. 20d to 60d, Wire, \$3.30; Cut, \$3.30; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 1/2c; less than one ton, 17 1/2c. No. 1*, 60%, carload lots, 13 1/2c; less than one ton, 15 1/2c. No. 1** 50%, carload lots, 11 1/2c; less than one ton, 13 1/2c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2*, 35%, carload lots, 9 1/2c; less than one ton, 11 1/2c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 725 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10 1/2c @ set; 14 oz., 40s., 9 1/2c.

CHEMICALS.—Cyanide of potassium, 98%—99%, jobbing, 25 @ 26c @ 3c; carloads, 24 @ 24 1/2c; in 10-lb. tins, 35c; sulphuric acid, in carboys, 66 1/2 B, 2c @ 3c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2 1/2 @ 3c @ 3c; blue vitriol, 5 1/2 @ 6 1/2c @ 3c; borax, concentrated, 7 @ 8c @ 3c; chloride of potash, 12 @ 13c; roll sulphur, 4 @ 6c; ground sulphur, 4 @ 6c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2 1/2c; nitric acid, in carboys, 8c @ 9c; caustic soda, in drums, 3 @ 4c @ 3c; Cal. s. soda, bbls., \$1.25 @ 1.50 @ 100 lbs.; sds, \$1.05; chloride of lime, spot, \$3.00 @ 4.00; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb tins; sulphide of iron, 9c @ 3c; copper sulphate, 5 @ 7c.

CEMENT.—Germania, \$2.50 @ 2.75; K. & B. S., \$3.00; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

OILS.—Linsed, boiled, bbl, 56c; cs., 61c; raw, bbl, 54c; cs., 59c; lots of 5 bbls, 1c less; Lucol oil, boiled, bbl, 50c; cs., 55c; raw, bbl, 48c; cs., 53c. Kerosene—Pearl, per gal., 22c; Astral, 22 1/2c; Star, 22 1/2c; Extra Star, 25 1/2c; Eocene, 24 1/2c; Elaine, 27 1/2c; Water White, in bulk, 16c; Mineral Seal, iron bbls, 18 1/2c; wooden bbls, 21c; cs, 24c; Mineral Sperm, cs, 26 1/2c; Deodorized Stove Gasoline, bulk, 18 1/2c; do., cs., 25c; 8 1/2 Gasoline, bulk, 21c; do., cs., 27 1/2c; 6 3/4 Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22 1/2c; Lard Oil, No. 1 bbl, 95c; cs., \$1.00; Neatsfoot oil, bbl, 70c; cs., 75c; No. 1 bbl, 55 @ 57 1/2c; cs., 57 1/2 @ 60c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 50 @ 55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; 1 ton and less than 5 tons, per lb., 6 1/2c; 500 lbs. and less than 1 ton, per lb., 6c; less than 500 lbs., per lb., 6 1/2c; in 25-lb. tin pails, 4c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead—in bbls, 1 ton and over, 6c; do. in kegs, 6 1/2c.

RED LEAD.—One ton and over at one purchase, per lb., 6c; 500 lbs. and less than 1 ton, per lb., 6 1/2c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb.; powdered, 9 @ 12c; fused, 25 @ 30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ 7c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—(90% and over) 3 @ 4c, \$1.25.

MERCURY.—Bichloride, 3 @ 4c, 90c.

PHOSPHORUS.—(American) 3 @ 4c, \$1.00.

SILVER.—Chloride, 3 @ 4c, 75c; nitrate, 55c.

SODIUM.—Metal, 3 @ 4c, \$1.25.

URANIUM.—Oxide, 3 @ 4c, \$3.50.

ZINC.—Metallic, chemically pure, 3 @ 4c, 50c; dust, 3 @ 4c, 10c; sulphate, 3 @ 4c, .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

HAVE THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from Andrew Cusledge in Forty Nine Pacer Mine, near Mountain Ranch, Calaveras County, Cal., draining into McKinney Creek which reaches Calaveras River; from Frank Vere in Elm Pacer Mine, near Quincy, Plumas County, Cal., draining into Taylor Creek which reaches Feather River; from Nelson Contracting Co. in Calaveritas Hill Mine, near Calaveritas Hill, Calaveras County, Cal., draining into Oneil Creek which reaches Calaveras River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., Feb. 9, 1903, at 1:30 P. M.



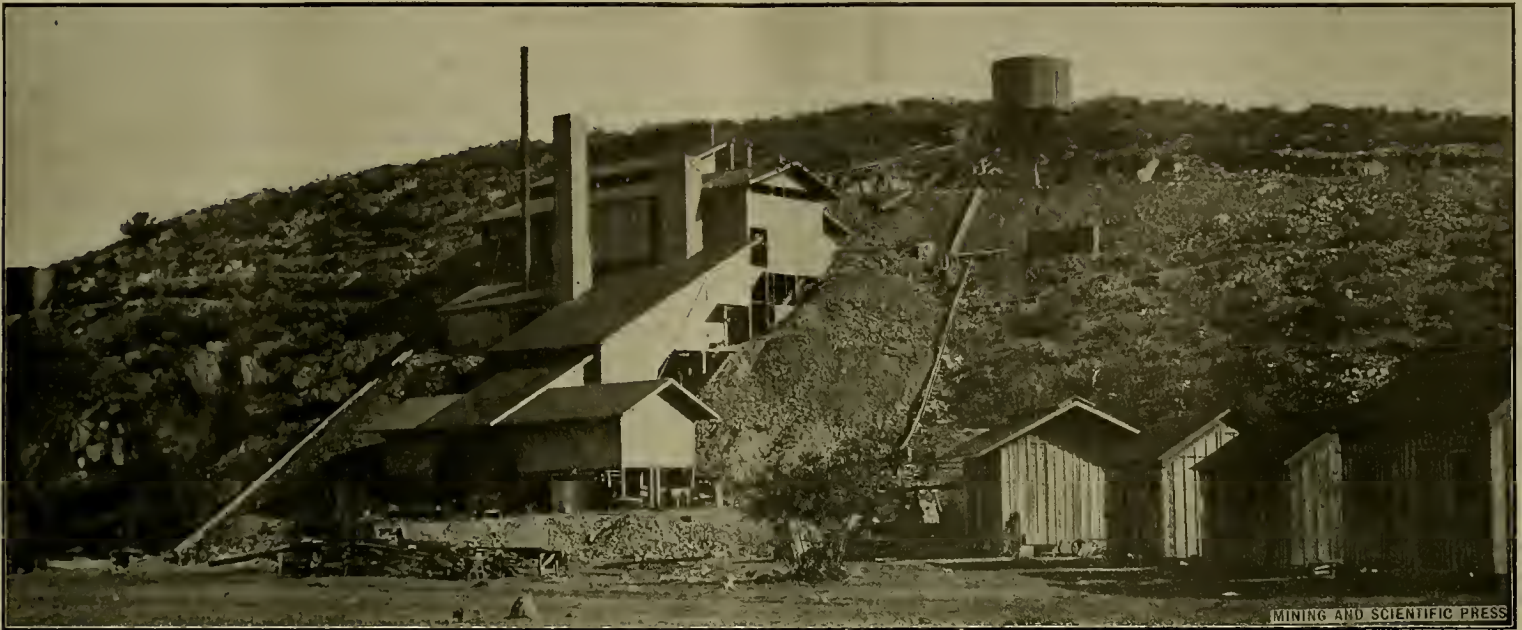
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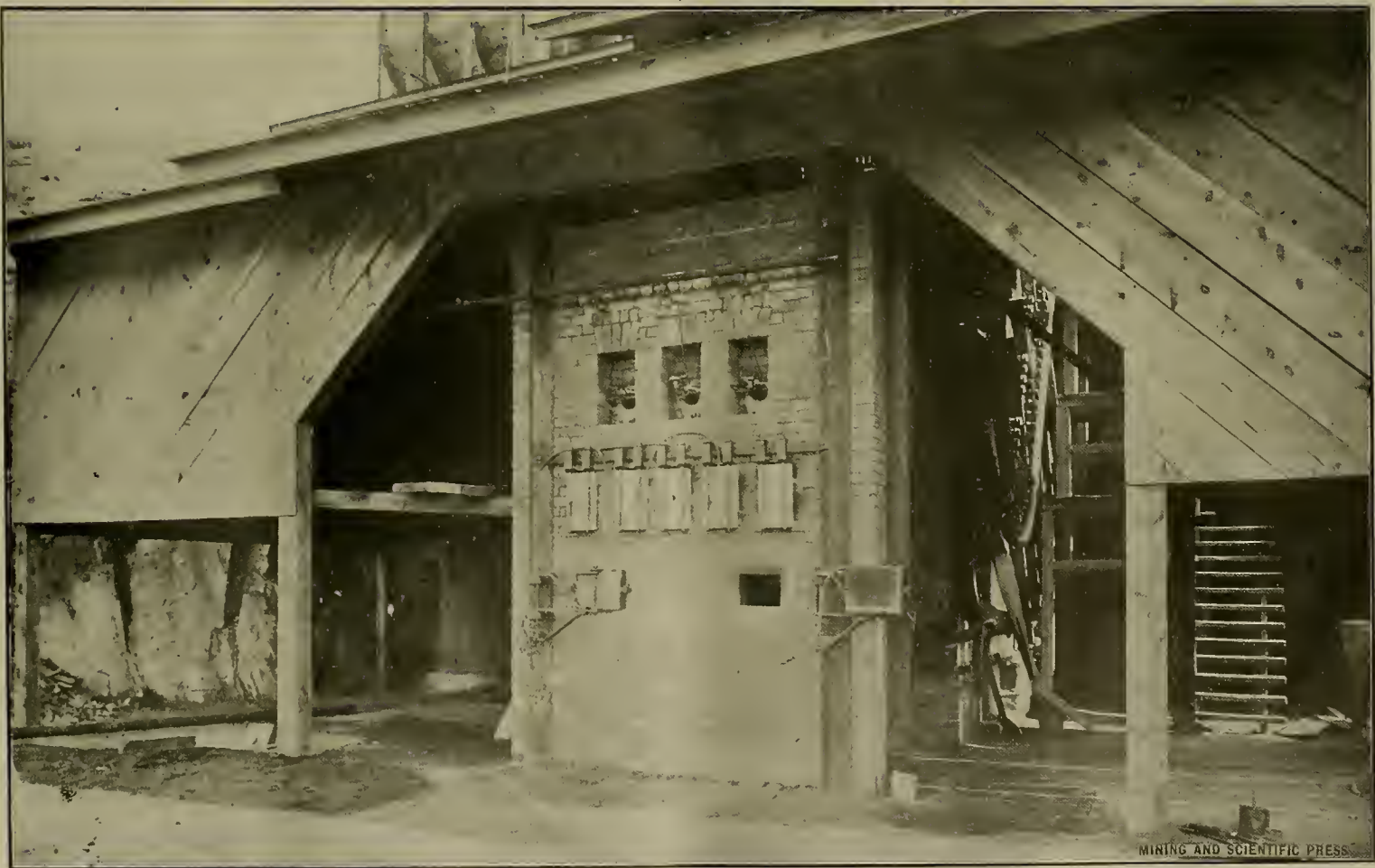
Whole No. 2219.—VOLUME LXXXVI.
Number 5.

SAN FRANCISCO, CAL., SATURDAY, JANUARY 31, 1903.

THREE DOLLARS PER ANNUM.
Single Copies, Ten Cents.



Hydro-Carbon Smelter, Mayer, Arizona.



Front View Hydro-Carbon Smelter, Mayer, Arizona.

A Hydro-Carbon Smelter.

At Mayer, Yavapai county, Arizona, a furnace of unusual construction has been built to smelt copper ores by a process employing crude petroleum as fuel. The ore is crushed to nut size, no piece larger than will pass a $\frac{3}{4}$ -inch ring. This passes down what may be termed the inclined hearth of the furnace, constructed at an angle of about 45° , at the foot of which is a horizontal hearth or floor. Upon this the

ore falls and extending upward on the inclined hearth is subjected to the powerful heat of the petroleum blast, the ore matting at and near the lower hearth, melting and flowing over into a lower compartment, the slag being tapped at one opening, and the matte at a lower one. The illustrations show a general view of the smelter buildings and surroundings, and of the front of the furnace from a nearer point.

The process is undergoing some changes, sug-

gested by experience, as is the case with most new processes. One important change suggested by M. P. Boss, the inventor of the process and furnace, is that of crushing the ore much finer, by which means it is expected more satisfactory results will be obtainable. The experimental runs have been made through the short period of two months under many disadvantages. When a constant supply of ore is available still more favorable results are anticipated in the application of this novel process.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Hydro-Carbon Smelter, Mayer, Ariz.....	65
Front View Hydro-Carbon Smelter, Mayer, Ariz.....	65
Allison Ranch Mine, Nevada County, Cal.....	69
Mill Allison Ranch Mine, Nevada County, Cal.....	69
Mill and Elevator Allison Ranch Mine, Nevada County, Cal.....	69
The Verde Mining District, Yavapai County, Arizona.....	70
Sketch Showing Adjustment of Corliss Valves.....	72
Automatic Circuit Breaker.....	73
Quadruple Horizontal Pump, Iowa Mining Co., Cal.....	73
Mining and Metallurgical Patents.....	74
EDITORIAL:	
A Hydro-Carbon Smelter.....	65
What the Cyanide Process Is Doing.....	66
Of Interest to Miners in Southern Nevada.....	66
The Secondary Enrichment of Ore Deposits.....	66
The Value of Managers' Reports.....	66
An Unusual Condition Prevailing on the Pacific Coast.....	66
MINING SUMMARY	75-76-77-78-79
LATEST MARKET REPORTS	80
MISCELLANEOUS:	
Concentrates.....	67
Stamp Milling and Amalgamation of Free Gold Ores.....	68
The Allison Ranch, Cal., Mine.....	69
Imports of Precious Stones into the United States.....	69
An Experiment in Amalgamating Auriferous Sulphides.....	69
The Verde Mining District, Yavapai County, Ariz.....	70
The Science of the Flywheel.....	71
Pyritic Smelting.....	71
The El Mundo Process.....	71
Concrete Foundations for Stamp Batteries.....	72
How to Set Corliss Engine Valves.....	72
Electrically Operated Oil Circuit Breaker.....	73
A Quadruple Horizontal Pump.....	73
Ore Handling and Transportation.....	73
The Earliest Data Respecting Mining.....	73
To Determine the Temperature of a Furnace.....	73
Chromic Iron Ore.....	73
Mining and Metallurgical Patents.....	74
Personal.....	79
Catalogues Received.....	79
Obituary.....	79
Commercial Paragraphs.....	79
New Patents.....	79
Notices of Recent Patents.....	79

AN index of what the cyanide process is doing for the development and operation of Black Hills, South Dakota, mines is found in the fact that 70-cent tailings are being treated direct from some of the mills of the Homestake Co. at a good profit. It is expected that a still further reduction in cost of treatment will be made.

THE recent purchase of the branch railroad from Goff's station, in eastern San Bernardino county, Cal., northward to Manvel, by the Santa Fe Co., and the fact that a corps of railroad engineers are afield in southern Nevada is a matter of interest to miners in that section. The extension of this road northeasterly, whether making connection with Salt Lake or not, will be of great benefit to the mines within reasonable distance of the line. The transportation problem is one of the most important that the miner has to struggle with in desert regions, and a railroad always renders great assistance in this regard. Distance in the desert regions of the southwest is not considered by the same standard as in sections more fortunately situated. There 30 to 60 miles, or as far as one can drive in twenty-four hours, is not looked upon as prohibitory, though the miner at the same time realizes the benefit of having a railroad nearer than at a greater distance. The extension of this road, to be known as the California and Eastern, would not fail to benefit the mines located 30 to 50 miles either side of the line, as fuel, supplies and timber, etc., could be delivered at greatly reduced cost, and much of the ore could be hauled elsewhere for treatment. Fortunately much of the ore of those regions is high grade and can stand the charges for transportation by railroad, when they would otherwise remain idle. The region along the proposed route abounds in ores of many varieties, and while these are generally high in grade, there are also large amounts of ore too low in grade to ever be worked without such benefits and opportunities as a railroad would afford.

The Secondary Enrichment of Ore Deposits.

Of late a great deal has been said and written concerning the secondary enrichment of ore bodies. Some of the theories advanced and conclusions reached are instructive, and some of them amusing. That such a condition as "secondary enrichment" under certain conditions does actually occur is indisputable, but this phenomenon is much more restricted in its occurrence than some writers on the subject seem to believe.

Many mineral veins, particularly those bearing lead and silver, or copper ores, are found much impoverished in their upper portions, though an increase in values in depth is noticeable, but in most instances these values are normal, and represent the values originally deposited, and are not, as a matter of fact, in a zone of secondary enrichment at all. In many copper-bearing veins and deposits, the metal is leached from the upper or superficial portions of the mass, iron oxides, silica and lime usually constituting the gossan. In exploring such deposits as depth is attained the carbonates and oxides of copper sometimes appear, and often form large and valuable ore deposits. Passing downward through these, the ore, either gradually or suddenly, turns to the normal sulphide, and as greater and greater depth is attained the average copper content of the rock grows less and less. The relatively rich upper portion (beneath the gossan) may be called a primary enrichment due to oxidation of sulphides, and to subsequent concentration by redeposition in the zone referred to, this resulting from the downward flow of waters, but the further or secondary enrichment in a zone intermediate between the zone of carbonates and oxides, and the normal sulphide zone below, in which are found chalcocite and numerous other more complex sulphide ores, rich in copper, and sometimes in gold and silver as well, is of relatively rare occurrence. This condition is pronounced in the mines of Butte, Montana, and has no counterpart on so great a scale elsewhere, though to a limited extent a somewhat similar phenomenon has been observed in other copper mines, notably in Arizona.

Secondary enrichment of the character indicated seems probable only in veins and deposits containing large amounts of sulphide ore, and in only rare instances is it likely to be found in veins and deposits not essentially of this character.

Highly siliceous gold or silver-bearing ores are not, apparently, subject to this sort of alteration. In the gold mines of California, representing a wide range of veins of this latter class, no such condition as secondary enrichment has been reported, if observed, unless the occasional occurrence of bunches or pockets of gold in some of these veins be considered as representative of this kind of deposit. The fact that these unusually rich shoots occur at greatly varying depth, from the surface down to 2500 feet and deeper, having no connection with each other, and that their existence has not, apparently, had any influence upon the vein in its vicinity, either to enrich or impoverish it, does not tend to strengthen the belief in a zone "of secondary enrichment" in veins of this class.

In some gold-bearing veins a reverse condition is found, that is, the ores at and near the surface are found to be richer than the ores developed in depth, and this, too, where the values are so evenly distributed as to preclude the supposition or probability that the superficial portion was originally richer. This condition is sometimes observed in veins much "honeycombed" and oxidized by meteoric agencies, and is particularly noticeable in the desert regions of the Southwest. The enrichment is probably due to the removal of certain soluble portions of the original gangue material, and the oxidation of the sulphides. A given bulk of this ore will weigh less than the normal ore, while containing the same quantity of gold, and in some instances, doubtless, there is an enrichment due to dissolution and redeposit of gold, at a lower point in the vein; but this may properly be called a primary and not a secondary enrichment of the vein. It is, no doubt, a matter of satisfaction, when working a payable mine, for the owner to contemplate increased returns when the greater depth in the zone of secondary enrichment is reached, while the miner who is working a property that fails to

pay expenses may console himself with the reflection that he will soon reach this elusive zone. But these are mostly fallacies, and the history of mining, with a few exceptions—valuable or interesting only mineralogically—proves that there is no good reason for such hallucinations.

That sulphide copper ores deteriorate in value with great depth (below 1500 feet) seems established by experience in mines of this character wherever worked to this depth or deeper, but that the same may be said of gold mines is not shown to be true, for the deepest paying vein gold mines in the world have rich and poor spots at all depths from the surface down to 3000 feet, and deeper, there being no uniformity in the amount of gold contained in the rock, while, on the other hand, the expense constantly increases with greater depth.

The Value of Managers' Reports.

The value of the periodical report of a mine manager or superintendent lies chiefly in the details of cost given. A report comprising tabulated statements, no matter how elaborate or to what extent the printer's art may have been employed, is of no practical value unless it deals with facts—all the facts—and makes it possible for others who know nothing of the conditions under which the costs were made, to gain a comprehensive idea of what has been accomplished, and by comparison to obtain valuable information. The annual reports of some mine managers contain nothing but general statements, though the reports in themselves are voluminous and, to the casual reader, apparently all that could be desired. These reports state the amount of receipts and disbursements, but no details are given, and one searching them for the purpose of getting the cost of doing certain work, or the cost of producing whatever the product may be, will find nothing upon which to base calculations. Then there are those who give the cost of certain things and omit others of equal importance. These reports on their face usually make a good showing for the superintendent or manager, but when carefully looked into it is found that important items and costs have been inadvertently or intentionally omitted.

When driving drifts and crosscuts, the cost sheet is incomplete unless it shows the cost of drilling, cost of power, if machines are used; cost of repairs of machines; cost of supplies; ventilation, timber and timbering; hoisting from that level; track laying, repairs, and, in fact, every item of expense that is incident to the opening, equipment and maintenance of the level. The amount of water taken from the level is also a charge against it, whether it be drawn in skips from a tank on the level, pumped to the surface or allowed to run down the shaft to be bailed from the bottom. Its proportional share of superintendence must also be included. Carefully prepared cost sheets giving these details often show a marked difference in cost per foot on various levels in the same mine. Investigation usually shows this to be due to a change in the character of the ground; the amount of timber necessary; quantity of water handled, or other causes.

In shaft sinking the factors influencing cost are as numerous as those in driving levels. The hardness of the ground; efficiency of machines, if used, and capabilities of the men (in either case); means for handling water, if troublesome; timbering, and size of the shaft—all are important. The charge for handling men, and timbers, and other materials cannot be omitted, and cost of hoisting is important. The latter constantly increases with depth, when all other conditions remain the same.

Unless all of these items are included in the statement, the report loses much of its value.

AN unusual condition at present obtaining on the Pacific coast is evidenced in the fact that large amounts of railroad rails and structural steel is being brought into California by vessel from Germany, the saving said to amount to from \$5 to \$7 per ton. These vessels after discharging their cargoes of steel take grain on the return trip to Europe. Securing full cargoes both ways has resulted in making it possible for German iron and steel manufacturers to successfully compete with those of the United States.

CONCENTRATES.

GOLD melts at 1240° Centigrade, and is slightly volatile.

THERE is no duty upon copper ore imported into the United States.

SERPENTINE is a hydrous, and talc an anhydrous, silicate of magnesium.

ASSESSMENT WORK done in any one year in excess of the requirement of the law can not be applied on the following year's assessment.

IN Overman's "Treatise on Metallurgy," published in 1852, will be found a description of the water-jacketed blast furnace in use at that time.

THE London lead quotation in this week's issue—£11 8s 9d—is per long ton (2240 pounds), and with United States exchange at \$4 8666 is equivalent to 2.49c per pound. The duty of 2½c is independent.

TO CALL "graphitic schist" occurring in an area of old crystalline schists "bituminous schist," simply because one believes that it may at one time have been a bituminous shale or sand rock, is not good nomenclature.

FREIGHT RATES on ore from Acapulco, Mexico, to San Francisco, Cal., vary according to values. On ore not exceeding \$100 gold per ton \$4 25 is charged; between \$100 and \$200, \$5; \$200 and \$500, \$7.50; \$500 to \$1000, \$10.

THERE is no remedy for headache caused by powder smoke (nitrous oxide), though there are several preparations which are represented to give relief. Sleep is the best remedy and the most effectual. Good ventilation in the mine is a preventive.

BRITTLE COPPER when heated to redness becomes soft and is said to be "annealed," whether cooled quickly or slowly. Commercial copper usually contains small amounts of silver, arsenic, bismuth, iron and other metals, but is pure enough for most practical purposes.

PURE potassium cyanide is made by passing the vapor of hydrocyanic gas into an alcoholic solution of potassium hydroxide, when the salt separates in small crystals. The potassium cyanide of commerce is made by melting dry potassium ferrocyanide. Mixing potassium carbonate with the charge increases the yield of potassium cyanide, but the product is said to be inferior in quality.

A ½-INCH steel rope of nineteen wires will give a factor for safety of six times the weight, or tension, on a tramway 1400 feet long, having 44% grade, with a car weighing 1000 pounds and carrying a load of 2000 pounds. This rope may be wound on a 3-foot diameter reel without injury, and the cars can be controlled with a band brake. The maximum tension loaded is 3412 pounds and empty 1348 pounds.

THE cheapest power is free water power, provided the necessary expense for making it available does not cost too large a sum. There are instances where the interest at usual rates on the money invested in dams, flumes, ditches, etc., and the cost of repairs in maintaining the water privilege, makes it more expensive than steam or electric power. This permits independence, but does not look like good business.

IN reply to questions concerning the issue of "Mineral Resources of the United States, 1901," the report for 1901 will appear as a distinct publication. As heretofore, it will contain a statement of the production of every mineral in the United States, with its value, where it is mined, etc. Application for the report should be made to members of Congress, who will have a limited number for distribution.

STEEL "T" RAIL weighing twelve pounds to the yard is sufficiently heavy to carry mine cars holding one ton of ore, if the ties are 6 inches wide and placed 30 inches from center to center. If the number of cars run over the line be large, or if they are run in trains of several cars each, a 16-pound rail is advisable. Underground, however, where cars usually carry but 1600 to 1800 pounds, and are trammed by men, 12-pound rail is recommended, as easier to handle at the shaft, and they can be bent at turns with ease.

PERIDOTITE is a dark basic rock similar to gabbro, but without feldspars, and with predominant olivine. Owing to the variations in the olivine the rocks of this group, though essentially similar, have various names. One variety—picrite—is a compound of olivine and augite. It is mainly olivine, and the rest a compound of augite, hornblende and magnetite; blackish green, and almost compact with olivine. It is the predominant rock at the diamond mines of Kimberley in South Africa, and has on this account unusual interest.

THE process of electro-plating metallic surfaces with silver is accomplished by placing the article to be plated

in a solution of silver cyanide in potassium cyanide, and connected with the negative pole of a battery, the positive pole of which is joined to a sheet of pure silver, also suspended in the solution. The electric current decomposes the silver cyanide, and the silver is deposited on the suspended article in a firm coating. At the same time silver goes into solution from the silver sheet suspended in the bath, thus keeping up the strength of the solution.

EFFECTIVE results cannot be obtained with a nozzle of any size when the pipe line is full only half way to the pressure tank, nor is the fullest efficiency obtainable when the pipe at the pressure box is not entirely covered by water, as otherwise air passes down the pipe line with the water destroying the fullest effect of the stream when delivered at the wheel. The greatest efficiency is obtained when the largest possible nozzle is employed, which still permits the pressure tank to remain full of water, but without overflowing. The efficiency is further increased if the water is 2 or 3 feet at least above the top of the intake pipe.

DIORITE may be described as a wholly crystalline, coarse and fine-grained rock composed of lime-soda, feldspars and hornblende, with mica and pyroxene, sometimes porphyritic. Its color is influenced largely by the texture of the rock and the amount of hornblende and pyroxene present. In color it ranges from light gray to dark green and black, though the black varieties always are found to be green in thin sections. When sheared, compressed and altered it becomes amphibolite schist. It may contain quartz in grains, and is then called quartz-diorite. Many valuable gold and silver veins are found in diorite.

CAREFUL chemical examination of the ore sent from Lake City, Colo., failed to show the presence of platinum. This metal has been found in numerous localities in placers, but in only a few localities in rock in place, notably in the Ural mountains in eastern Russia. Whenever observed in rock it has been found in dark basic rocks like serpentine and peridotite, and not as yet in diorite or other igneous or sedimentary rocks. Diorite is specifically mentioned as the country rock sent with the ore, appears to have been diorite, now much altered. It contains marcasite (white iron sulphide) and the ore consists of a mixture of fine grained galena, zinc blende, iron sulphide and a little copper sulphide. It may also contain gold and silver. No determination for these metals was made.

THE usual cause of particles of hard amalgam being found on the concentrating tables, and in the tailings, may be assigned to a careless mill man. Sometimes it may be directly due to a marked variation in value of the ore, but the mill foreman or head amalgamator is there to look out for such occurrences. A mercury trap will assist in catching hard amalgam scoured from the plates on "loaded quick" which runs off in globules. A suitable trap for a 5-stamp battery is similar to those in use in the Homestake mills, South Dakota. The dimensions are 8 inches wide by 10 inches long, 18 inches high at one end and but 6 inches at the other, with three sheet iron partitions, arranged like those in zinc precipitation boxes in cyanide works, the pulp passing alternately over one partition and under the next. This has a tendency to quiet the flow of the material, giving the quicksilver and gold an opportunity to settle.

IN the location of mining claims the proper direction of end lines is of greater importance than that of the side lines. The end lines must be parallel or the locator loses his "extralateral right." The side lines need not be parallel, however. Often in new mining districts, before the vein system is well understood, locations are made in many directions and numerous conflicting claims result. Many irregularly shaped pieces of ground remain when claims are taken thus indiscriminately, and these are also subject to location, provided the locator can find the apex of a portion of a vein in the tract. Often these pieces of ground form but a small fractional part of a full claim, but the locator must see that, having found the apex of a vein thereon, he makes his end lines crossing the lode line parallel to each other, regardless of the irregular outline of the balance of the claim, even if he is obliged to cut out a portion of the unclaimed ground to comply with the law, otherwise, as above stated, the locator is not entitled to follow his vein beyond a plane drawn downward vertically through his boundaries. When a junior locator, inadvertently or otherwise, so places his stakes as to include a portion of a prior location he can only get title to that part of his claim defined by the lines of the prior locator, but again, in the event of this resulting in non-parallelism of his end lines, he is debarred from the enjoyment of the extralateral right. In a circular of the land department issued October 25, 1895, the Commissioner of the General Land Office sanctioned the right of a junior to extend one-half of his end line within the surface lines of a prior location for the purpose of paralleling the end lines, but "Lindley on Mines" thinks this is based on an erroneous construction of the law.

MOST of the States and Territories subject to congressional mining laws have enacted statutes providing for proof, in the form of affidavits establishing the fact that the annual labor for a given year has been performed. This class of legislation is found in California, Colorado,

Idaho, Montana, New Mexico, Utah, Wyoming, Arizona and Nevada. The failure to comply with the law by filing such affidavit is accompanied by no serious penalty. There is no provision in any of the State or Territorial statutes to the effect that a failure to comply with its terms will work a forfeiture. A forfeiture of a mining claim can not be established, except upon clear and convincing proof of the failure of the locators or owners of the claim to have work done or improvements made to the amount required by law. For the purpose of curing defects in location, or readjusting boundaries, an original locator may relocate a claim. This is called an "amended location." Where the original locator seeks to evade the requirements of the law as to development work, or annual assessment, and endeavors to hold his claim by a new location of the same ground, such right has been recognized by the Circuit Court and by the Land Department; but this must be done before entry by another. While certain State courts have decided that an original locator may relocate a claim upon which the annual assessment work has not been performed, and repeatedly do the same periodically, "Lindley on Mines" says that this would defeat the purpose of the law and is a fraud upon the Government, and intimates such practice would not stand the test of the Supreme Court of the United States. It is not necessary to file a notice of relinquishment; but, if it is desired to hold a forfeited claim, the original locator may do so, if not already claimed by another, by commencing at once to do the neglected assessment work and continuing it to completion.

THE States and Territories may make laws regulating the location of mining claims, annual labor, etc., but these can in no manner conflict with the laws of the United States. In Arizona the Act of 1895, Section 3, says: "Before filing location certificate with the recorder of the proper county the discoverer shall locate his claim by: First, sinking a discovery shaft upon the premises, so claimed, to the depth of at least 10 feet from the lowest part of the rim of such shaft at the surface, and deeper, if necessary, until there is shown by such work a lode deposit or mineral in place; second, by posting at the point of discovery, on the surface, a plain sign or notice substantially conforming to the location certificate; third, by marking such claim or premises on the ground so that its boundaries can be readily traced." Section 5 of the same Act reads: "Any open cut, cross-cut, adit or tunnel, which shall be made as above provided for, as a part of the location of a mining claim, and which shall be equal in amount of work to a shaft 10 feet deep, and 4 feet wide and 6 feet long, and which shall cut a lode or mineral in place at the depth of 10 feet from the surface, shall be equivalent as discovery work, to a shaft sunk from the surface." The law of 1901 is similar to that of 1895, but requires for a valid location that the locator shall within ninety days from date of location, monument his claim, perform the work above described, and record the location with the county recorder. It may be further stated in the case of Arizona, that although the law does not specifically say so, eminent legal authority is of the opinion that the work required by the Territorial law is a portion of the act of location and may not be considered as "annual assessment work" required by the Federal law, as this latter must be performed in addition to the "location work." The Federal law permits States and Territories by legislation to increase the amount of work required on a mining location, but they cannot make the amount of annual assessment less than \$100.

THE early experiments on the cyanide process were made at the Calumet mill, Shasta county, Cal., then under the management of Almarin B. Paul, who went to Denver, Colo., for the purpose of investigating the process, and who was the first to introduce it on the Pacific coast. THE MINING AND SCIENTIFIC PRESS was the first to give full data as to these first workings. These can be seen by referring to papers of the following dates: March 5, 1892; April 9, 1892; June 4, 1892; July 2, 1892, and January 26, 1893. In Mr. Paul's letter of June 4, 1892, occurs the following respecting a weak solution of cyanide: "The McArthur-Forrest process is the use of a weak solution of cyanide of potassium. The strength of cyanide being as your ore may show is required." Mr. Paul's first workings on a practical scale of ten tons per charge was more successful than were the Denver workings, and so surprised were they that they sent out one of their company to investigate, and who stayed at Calumet for a week, Paul's extraction at times running as high as 95%, but usually from 85% to 90%. The first workings were with 1% solution, then Mr. Paul commenced experiments on a reduction, the first being three-fourths of 1%. This giving as good a percentage of extraction, he then used one-half of 1%, and so on down to one-sixth of 1%. These experiments caused Paul to adopt one-fifth of 1% as producing as good results as a higher percentage; these experiments all being made on the same ore were conclusive. Mr. Paul was also the first to use a weak solution of cyanide in the battery, as the following lines show in his letter published in the MINING AND SCIENTIFIC PRESS and bearing date January 7, 1893, as follows: "As to the matter of wet or dry reduction of ores, I am decidedly in favor of the wet, using the solution in the battery, and more especially, as I see what can be accomplished by a low per cent of cyanide." Paul worked this return system through the battery, until the mill was leased to Eastern parties, who returned in their milling to the ordinary way.

Stamp Milling and Amalgamation of Free Gold Ores.

NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by DANA HARMON, San Francisco, Cal.

GREASE BOXES OVER MORTARS.—Note that the upper box C laps over box B about 1 inch, so that a small segment of the circular opening is made on box B. Along the sides of the posts, and above these boxes, nail iron flashing to throw the grease from

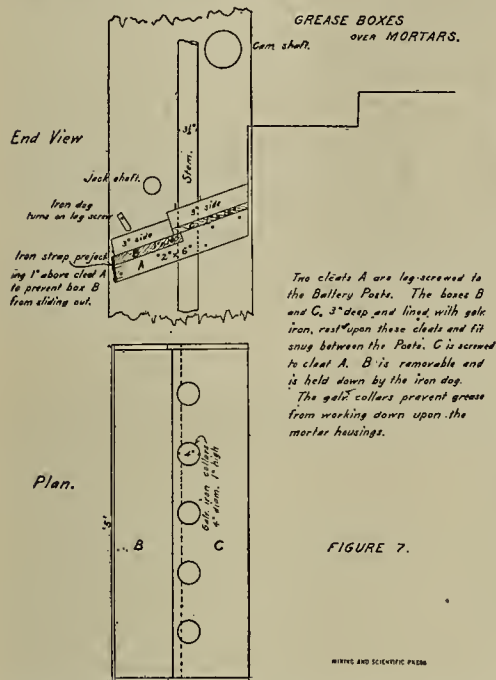


FIGURE 7.

the cam shaft boxes into these wooden grease boxes. The vibration will tear this flashing loose in a few months. Replace with new.

Albany Compound, or a similar but much cheaper brand known as New York Compound, is suitable for cam shaft boxes. For tappets, what is called commercially "gear grease" will be found to have the necessary sticky or gummy quality.

ELECTRIC LIGHTS.—To avoid breakage from the jar, the cleats and lamps should be attached not to the battery frame, but to guy wires stretched across the mill building.

ROPE DRIVING.—On mills larger than ten stamps the rope drive is decidedly the most economical, because it will run year in and year out with none of the stoppages to lace incident to the rubber belt. Every millman knows the vexatious delays and superintendents know the costs these stoppages involve by reason of reduced crushing.

Where water is the power the use of the rope drive will enable you to utilize the maximum fall from the penstock.

The drive way must be dry and should be well lighted. If the distance between the centers is so great that idler sheaves are necessary, they should be made light and with short hub length, so that the ropes will run close together, as they do on the driving sheave.

The same principle is certainly applicable to the cam shaft by placing the line shaft behind the ore bin. There should be sufficient head room on the tappet floor for a man to pass between the top and bottom ropes. It will be seen that a 20° slope admits of placing the line shaft behind the ore bin and near the ground line.

The best way to lay up a cam shaft pulley is to have all the boards radiate from the hub and to extend full length from hub to rim. Another way is to lay the boards transverse to the shaft. It may be that foundries prefer the latter method in order that a carpenter may turn off more work per week. It will be found, however, that in operation the strain of the belt and the jar tend to make the transverse boards "work," until in a short time the rim boards drop or give at every revolution of the pulley. Where the boards radiate from the hub there will be no such drop. In the one case you are depending upon the nails and bolts keeping the pulley in place; in the other you have the full strength of the fiber of the wood.

MORTARS.—Fig. 8 shows a type of mortar which yields good results both as a crusher and amalgamator on quartz. The liners are flush with the screen opening, so that there are no pockets in the mortar behind the screen. The end liners and also the bottom piece of the back liner are made of manganese steel. The front liner is of cast iron, because protected from abrasion. The wear of liners varies greatly with the ore. The important measurements

on this mortar are as follows, taken from center of stem:

On the discharge line.....	In.
On the discharge line.....	to screen 12
10 inches higher up, i. e., at top of screen.	to back 9
10 inches higher up, i. e., at top of screen.	to screen 13½
At top of new die.....	to back 9½
At top of new die.....	to screen 11
At top of new die.....	to back 6½
Length of screen opening.....	52½

It has often been suggested that instead of building so many stamps it would be cheaper to have fewer stamps for crushing coarse, as in a gravel mill (¾-inch mesh), and finishing in a Huntington or Bryan mill. Suppose that the product is to be 100 or 110

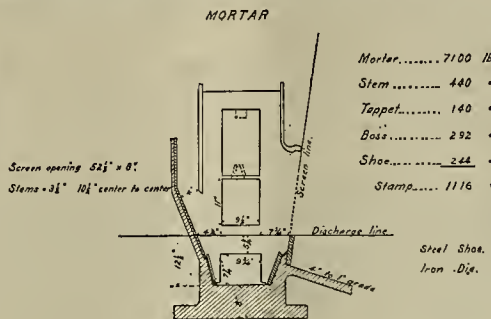


FIG. 8.

tons per day. This would call for not less than twenty-five and probably thirty stamps, costing say \$30,000. By the other plan there would be ten stamps and three 5-foot Huntingtons. The power and concentrator equipment will be practically at the same cost for either.

There will be a saving on installation of \$5000 to \$7000, but the bills for extras and wearing parts will be much heavier on the latter plan.

If the ore is hard quartz I would prefer all stamps. If the ore is soft, with an abundance of clay or dirt, the Huntington or Bryan will give the better results, as both are fine amalgamators. In fine, if the ore is so soft that the stamp pounds on the die continually, the stamp mill is not the machine required. There must always be a cushion of rock between shoe and die. It is the test of the battery man's skill to keep this cushion at the minimum, so as to barely escape pounding, and never let his mortar fill up.

MILLING.—I hold fast to four central ideas: First—On free gold ores the mortar has the two functions of crushing and of amalgamating. Second—On ores running less than \$12 per ton the method used must be such as to extract practically all the recoverable gold. We will not now discuss ores running \$40 and over, because on these a tailings loss of \$5 to \$7 may be commercially permissible. Third—If the ore is hard enough to require a rock breaker, build a heavy stamp mill, otherwise you may use one of the various rotary mills. Fourth—Do not try to economize on rock breakers. It is the cheapest initial crushing—one to the mill not enough.

There is a good deal said nowadays about high duty of the mill, i. e., large crushing. Directors relish five and one-half tons to the stamp and superintendents do not object to this high duty, because it insures low costs per ton to their mining and milling record.

I believe in crushing all possible consistent with full recovery of the gold. I can not indorse a given type of mortar merely because it is a rapid crusher. High duty should mean low tailings.

The narrow, straight-hack mortar, with low discharge, is not a new idea. The foundries are full of old patterns of this type. All our cement gravel mills are so built, but it is not enough to crush rock; one must also catch gold. Sacrifice amalgamation to crushing, and you will have the penalty of high-grade tailings.

Taking up, now, seriatim, these four captions:

THE MORTAR HAS THE TWO FUNCTIONS OF CRUSHING AND AMALGAMATING.—Gold amalgam is a slippery eel—it rolls and floats unless fairly treated. Give it a chance and it will settle in the mortar. It is not so hard to catch fine gold inside the mortar if the mortar is built for that purpose. The limit of crushing in a given mortar must be measured by the percentage of inside amalgamation, except, however, on ores carrying values of \$1 to \$1.50 per ton of fine, light gold. The aim should be to increase the inside catchment above 60%. The tendency of stamping is to combine the gold with the mercury. It is natural that this amalgam should stay inside, and it will unless the millman expels it in his scramble after a high-crushing duty.

EXTRACT PRACTICALLY ALL THE RECOVERABLE GOLD.—Whoever has used quicksilver has lost gold. Whoever has crushed ore has had uncrushed particles of sand carry some atoms of gold stowed away inside these particles. Therefore, tailings must assay something. It is a commercial question. You may be able to afford some loss in order to get through a larger tonnage. To illustrate:

Preparing a tailings sample for assay by screening

through a 40-mesh screen, we find that 2% of the sand rests on the screen, and the fire assay shows values of 5 cents or 10 cents per ton in the fine sands and \$1.50 per ton in the coarse.

The results may be tabulated:

98 tons at 5c. = \$4 90	or at 10c. = \$9 80
2 tons at \$1 50 = 3 00	3 00
100 tons = \$7 90	= \$12 80
i. e., 8 cents to 13 cents per ton.	

I am quoting actual results, not giving theories. The crushing was at the rate of 3 tons per stamp through No. 2 tin screens.

The values in this 2% coarse sand could have been saved by using No. 1 tin, but it would have been at reduced crushing tonnage and would have shaved close to the sliming danger.

I call this extracting practically all the recoverable gold.

To increase this crushing to 5½ tons and thereby the tailings to 75 cents per ton would be business suicide, regardless of whether there were 10,000 or 100,000 tons in the mine.

USE STAMP MILLS ON QUARTZ.—Somebody may invent a better machine than the California quartz mill for crushing rock and catching gold. It has its faults, and yet its much condemned sliming tendency is too often the fault of the millman. It is simple, relentless, conscientious, with fewer faults than cling to many of its operators.

If you have mud to stir, buy a rotary mill and stir it. But if you have rock to crush, build a heavy California stamp mill, with the shoe 9½ inches and the die 9½ inches diameter—the whole stamp weighing about 1100 pounds—10½ inches from center to center of stems.

More than one man has asserted that his ore did not require a heavy stamp. The man has never tried the two weights on the same ore. Nevertheless he knows, or, what is the same thing, he is sure he does know. If the ore at one mine happened to be harder than at another, he would endeavor to effect a cure by giving more drop to his light stamp. If the rock still resisted and the stamp bounced, he would settle back on the excuse that he had very hard ore, for which misfortune he was not responsible.

I have had an 850-pound and a 1100-pound stamp on the same line shaft and on identical ore. The former crushed 1½ to 1½ ton per stamp and the latter 3 to 4 tons per stamp. The light stamp could not do better, no matter what drop.

Now, then, how fast shall we run this heavy mill? What drop?

We are mixing in with factors that belong to plate amalgamation, of which later.

I want a heavy stamp because I don't want to waste time breaking rock. I want a shoe and die of large area so as to embrace many pieces of rock at every blow. If you reduce the crushing area from 9½ inches to 8 inches you are compelled to make up the deficit by speed or by a long drop.

Bring a sledge whack upon a boulder. If you don't break it, you hit harder the next blow. You don't hit oftener. Probably you will strike slower—you succeed by muscle, not by agility.

So it must be with a stamp mill. Stamp crushing is not a question of spalling rock—it is to crush and amalgamate ore that has been, as it were, already spalled by the rock breaker.

I have run mills upon unusually tough, hard ore—first-class road metal, some of it. And this is what I find: With a speed of 92 to 94, and a drop of 6 inches to 7 inches, an 1100-pound stamp will crush about 80 tons in twenty-eight days, saving practically all the gold. Increase the speed to 100 to 102, and the drop to 8 or 9 inches, this same stamp will crush about 110 tons in twenty-eight days, and give 65 to 90-cent tailings. Reducing this to dollars, there was the alternative: a tailings loss of \$300, or \$2200 per month, according as the crushing was 2000 or 3000 tons.

So, then, my rule is to get weight and area of stamp, so as not to waste time, and to drop as the tailings assays dictate.

High speed means more wear and tear, hot boxes, greater percentage of breakdowns. If you can reach the limit of profitable amalgamation by a slower speed, why not do it?

I have never run a stamp heavier than 1120 pounds. That is heavy enough.

It is easy to crush more than you can amalgamate. It is for this reason that I am unable to give assent to the theory of installing a system of rolls and crushers so as to deliver a cracked corn product to the stamps. For some mysterious reason there is benefit to amalgamation by churning rock in a mortar. I am no sufferer if it does take a little more time in the making of the hutter. If the mine needs more stamps, buy them.

Before a 5-stamp battery 5 feet width of plate seems to be the practical limit. Six feet is too wide, and 5 feet will give better results than 4.

I have tried a launder before ten stamps, the pulp being thence passed to three tables each 4 feet wide. This was a failure. By no adjustment of gates and water could even distribution and flow be obtained. One table was all sand and another all slimes. The wave—the crescent bow—was not there.

Don't economize on rock breakers. One breaker

to the mill is the rule, and ordinarily this means that much of the ore going into the feeders will not pass a 2½-inch ring. It would not cost much to cut this product to 1-inch ring size, and a very noticeable increase in crushing will result. With a 1-inch ring product there will be fewer broken stems and consequent delays.

AMALGAMATION.—

Catch the gold close to the die.
Don't use chuck blocks or inside coppers.
Don't slime by too fine crushing.
Don't crowd tables with too much pulp.
Don't sluice the pulp over the plates.
Don't add water outside the mortars.
Don't be afraid of steep grade to tables.
No distributing boxes.
Don't turn all the pulp on one-half the plate area when brushing up.

Don't scrape plates with chisel or ruhher. Ruh up with a cotton cloth and tepid water, finishing with a whisk broom. Lip plate, however, is scraped off monthly with a chisel. Old files, 1½ inch wide, make good chisels.

Feed quicksilver so carefully that never a globule of free quick appears on the plates.

Feed low, i. e., regulate the feeder so that the shoe is kept just cushioning on the die.

Run the hatteries with the splash and not with the wave motion, i. e., lift the shoe above the water at every blow. This checks the sliming of deep discharge.

Use automatic sampler on tailings.

Avoid the use of acids and cyanide on plates. Common lye will cut grease.

Keep the quicksilver clean by retorting and then washing well with dry lime. Follow this treatment with thorough washing in clean water. In lieu of this clean with a strong solution of cyanide of potassium.

Use well silvered plates. When they turn green replace them, and don't waste time and gold over nostrums.

(TO BE CONTINUED.)

The Allison Ranch, Cal., Mine.

On Dec. 3, 1902, the stamps of the Allison Ranch mill were dropped on ore from that mine in the Grass Valley, Cal., district, adding their roar to the hum of

receiving point. An automatic tipper distributes the ore uniformly to the battery bins. The battery bins form the "back-knee" of the battery frame and have a capacity of about three days' supply for the mill when in operation. The ore is delivered to the mortars by James suspended ore feeders. The battery frame is entirely of wood; the mortar blocks are set in pits excavated in solid granite. The mortars are of medium width, designed for inside amalgamation, are steel lined and constructed with roomy front openings to permit ready access to the inside of the mortar. The stamps are arranged in groups of five, ten being driven by each cam shaft, and weigh 1000 pounds each. The shoes, dies, heads, cams and tappets are of steel; the cams are steel and self-fastening. Inside chuck plates are used, and the outside copper plates, 54 inches by 12 feet in size, are arranged in movable trays. Launderers from the trays deliver the crushings to four Wilfley tables. The line shafting runs back of the mortars, close to the battery sills, in ring-oiling, rigid boxes, mounted on iron stands bolted to concrete foundations. All line-shaft pulleys are cast iron and made in halves. A 3-ton traveling crane is suspended from the trusses over the battery and a trolley is arranged under cam platform for transporting shoes, dies and amalgam safe. A clean-up harrel and retort are provided, located in a fully equipped clean-up room on level of copper-plate floor.

Power is supplied by three induction motors; one 15 H. P., driving the rock crusher and conveyor, is located in the bin at the lower end of the conveyor; one 50 H. P. drives the stamps and a 5 H. P. is provided for the concen-

503,916; other precious stones, \$3,751,333; total, \$20,723,816. For the corresponding period in 1901 the total value was \$19,895,418, showing an increase in 1902 of \$828,398, or 4.2%.

An Experiment in Amalgamating Auriferous Sulphides.

At the Black Oak mine, near Soulshyville, Tuolumne county, Cal., Superintendent Guy Scott has been making some interesting experiments in amalgamation of the auriferous sulphides of that mine. These sulphides are chiefly pyrite, pyrrhotite and chalcopyrite, with smaller quantities of galena and zinc blende. The sulphides were taken from the vanner washing boxes and placed in an iron vessel made from a piece of 6-inch pipe, 18 inches in length,



Allison Ranch Mine, Nevada County, Cal.



Mill, Allison Ranch Mine, Nevada County, Cal.



Mill and Elevator, Allison Ranch Mine, Nevada County, Cal.

activity that has characterized the valley in which the mining plant is located since the property was taken over by its present owners about six years ago.

The mill is a 20-stamp gold mill, with copper plates and concentrators and is driven by electric power. It is located on the side hill on Wolf creek opposite the hoisting works, about 400 feet from the point where the ore is received from the mine cars and 67 feet higher than the collar of the shaft. The location of the mill at a distance from the hoist was necessary on account of the large waste dump, covering the entire space near the works, and on which suitable foundations could not be obtained, and the desire to secure grade for the proper handling of the ores within the mill. The designers have skillfully worked out the problem of transporting, elevating and delivering the ore to the mill economically and conveniently. By means of cars, the ore passes from the mine to an ore bin built near the hoist, where the ore is screened over grizzlies and the coarse reduced by a 9x15-inch Giant breaker to pass a 1½-inch ring. The bin holds thirty tons of ore. A gate in the bottom of the bin is opened and the ore passes onto an inclined belt conveyor, which delivers it to the ore bins in the mill, 240 feet away and 50 feet higher than the

trators. Substantial buildings cover the ore bin and rock breaker; a suitable house on a trestle completely covers the beltway. The mill building is of substantial construction and pleasing design. Wings from the main building form the clean-up room and a dry house for drying and storing sulphurets. Concrete or matched board floors, easy stairways, handrail-protected platforms and beltways, numerous windows well distributed, well-arranged launders and drains, make up a complete and perfect mill. The building is lighted with electricity. The buildings are of wood, uniform in appearance with the hoisting works, compressor house, shops, etc., making a pleasing whole. Under the direction of Superintendent Robinson, the mill is running successfully.

The mill is from plans and specifications of Harron, Rickard & McCone of San Francisco, Cal., which firm built the plant, turning the same over to the mining company in complete working order.

IMPORTS OF precious stones into the United States for the ten months ending October 31 are valued by the Treasury Department as follows: Diamonds, uncut, \$5,379,567; diamonds, cut but not set, \$11,-

and provided with a screw cap on each end. One end is closed, and a quantity of the sulphides placed in the vessel with a small amount of quicksilver and water.

A piece of stamp stem, nearly the length of the vessel, is then inserted, and the vessel clamped horizontally in a turning lathe, and revolved for several hours. The section of stamp stem acting as a muller grinds the sulphides to a fine state of division and permits the gold thus mechanically freed to unite with the mercury. By this simple means, though only an experimental test, Mr. Scott says he extracts 90% of the assay value of the gold, the tailings being subsequently treated by cyanide solution by agitation with a recovery of a high percentage of the remainder of the gold. How this will work on a commercial scale remains to be determined. The method employed in making the experiment is novel, although the fact that gold in sulphides could be amalgamated by fine grinding has long been known.

Experimenting in this way often leads to important results, and the application of this method to the treatment of sulphides on a commercial basis is of great interest.

The Verde Mining District, Yavapai County, Arizona.

Written for the MINING AND SCIENTIFIC PRESS by
G. W. MILLER, E. M. C. E.

This district, one of the oldest known mineral localities in Arizona, received a new impetus about a decade ago, by the transformation through W. A. Clark of the United Verde mine. Up to that time the property had been an unprofitable silver-

yet by following the contour of the mountains no more extraordinary difficulty was encountered by the engineers in bringing the railroad into Jerome than is generally met with in other mountainous regions.

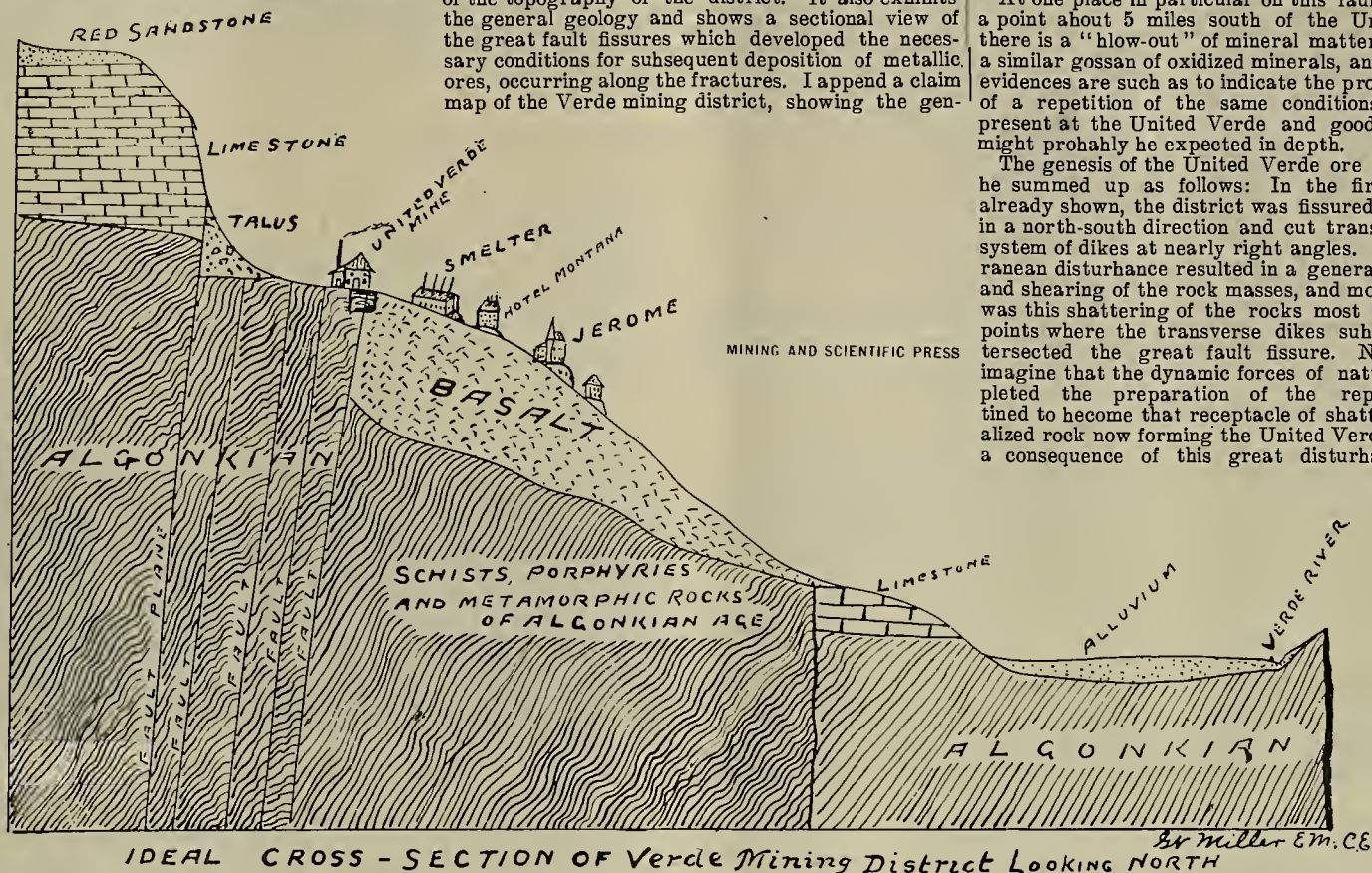
My description of this district shall be confined to the geology and economic peculiarities of this property. I take the United Verde mine as a typical geological representative, as it is the only property extensively developed in the district.

The accompanying ideal cross section through the Black Hills range is intended to give a general view of the topography of the district. It also exhibits the general geology and shows a sectional view of the great fault fissures which developed the necessary conditions for subsequent deposition of metallic ores, occurring along the fractures. I append a claim map of the Verde mining district, showing the gen-

heaval of the mountains, subsequent to the deposition of the red sandstones and associated with the basalt flows. Along this particular series of fissures is a vast mineralized mass of laminated, altered rocks, belonging to the "Basal Complex," and containing low-grade ores for a distance of 2000 feet in a northerly and southerly direction by 450 feet in an easterly and westerly direction. This particular ore belt extends through the "Basal Complex," much intruded by volcanic rocks, for a distance ranging from 12 to 18 miles, and shows small ore deposits in place at various points.

At one place in particular on this fault fissure, at a point about 5 miles south of the United Verde, there is a "blow-out" of mineral matter, exhibiting a similar gossan of oxidized minerals, and where the evidences are such as to indicate the probability here of a repetition of the same conditions that were present at the United Verde and good copper ore might probably be expected in depth.

The genesis of the United Verde ore deposit may be summed up as follows: In the first place, as already shown, the district was fissured and faulted in a north-south direction and cut transversely by a system of dikes at nearly right angles. This subterranean disturbance resulted in a general shattering and shearing of the rock masses, and more especially was this shattering of the rocks most extensive at points where the transverse dikes subsequently intersected the great fault fissure. Now we may imagine that the dynamic forces of nature had completed the preparation of the repository destined to become that receptacle of shattered, mineralized rock now forming the United Verde mine. As a consequence of this great disturbance of the



IDEAL CROSS - SECTION OF Verde Mining District Looking NORTH

gold and copper producer for over a quarter of a century. It has been, during the last decade, and down to the present time, a sensational and far-famed copper mine.

This mining district is situated on the eastern slope of the Black Hills range, about 1500 feet vertically below the summit, and at an altitude of between 5000 and 6000 feet above sea level. It is

eral course of the fault fissures, and also a geological, longitudinal section, made to a scale of 1 inch, equalling 500 feet. This longitudinal section shows the ore deposit and mine openings of the United Verde mine.

The geological history of the district may be summed up as follows:

First, an immense upheaval of the various sedi-

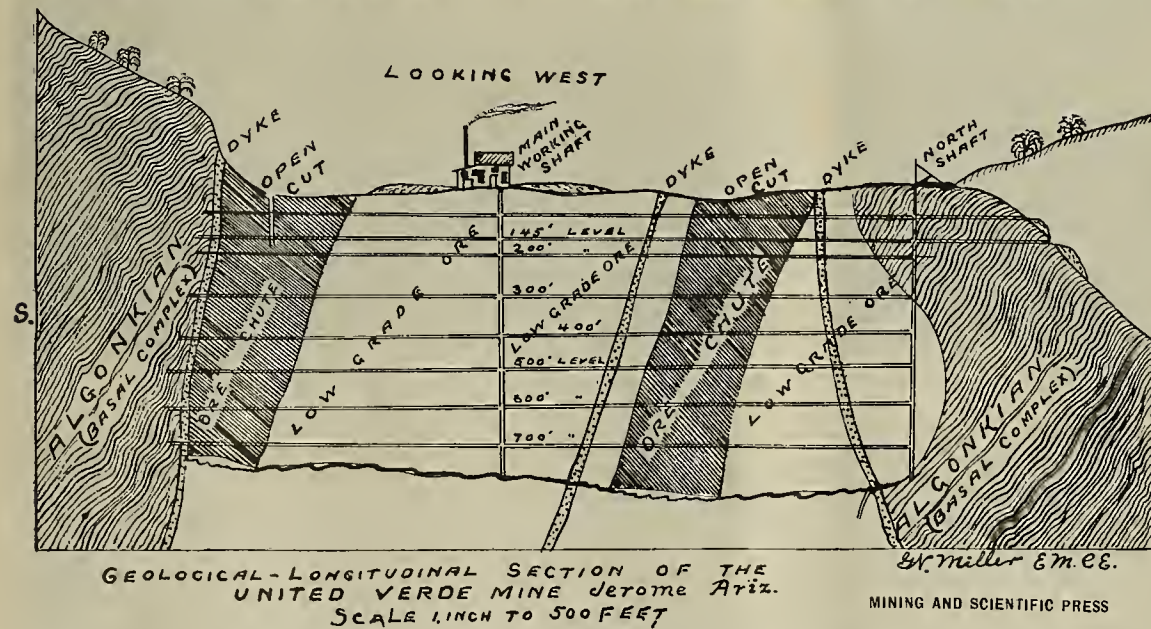
earth's crust, subterranean waters impregnated with minerals in solution flowed up from the depths below to begin the task, to be carried on for countless ages, of depositing their metallic burden in the innumerable rents of the previously outlined ore deposits, while these mineral waters steadily circulated through them.

Still further explanation of this remarkable chemical phenomenon seems necessary, in that the pay ore of this deposit lies in shoots or distinct outlined pockets; and also close observation reveals the fact that the ores possess or retain in some instances the texture of the surrounding rocks of the "Basal Complex," thus naturally suggesting the probability of a chemical transformation of the former into the latter. This process of mineral deposition is known to geological science as "metasomatism," and it is here beautifully illustrated as representing one of the most potent agencies to which may be ascribed the true theory that accounts for and explains the natural process which operated to form the ore deposits. Thus we may suppose that the ores were obtained metasomatically, that is, there was a molecular substitution of the minerals contained in the circulating waters for particles of the shattered country rock. This interchange was atom for atom until the shattered mass of rocks had become replaced by metaliferous substances and the displaced country rock taken into solution and carried away.

The occurrence of two distinct ore shoots, to which all the pay ore of the mine is confined (see drawing), may be accounted for on the hypothesis that

these chutes mark ancient water channels, where the agencies of mineral deposition operated more effectively and perhaps were confined to these certain points more exclusively or for longer periods of time.

This mine, as stated above and shown in drawing, comprehends a vast mineralized chamber in so-called diorite (improperly so named by the miners) 2000 feet long by 450 feet wide, the pay ore of which is limited to two regular shoots, the average longitudinal length along the zone of mineralization of each being about 300 feet. These extend transversely across the zone of intervening poor ground for a distance of 450 feet. The surface outcrop of these chutes is rendered particularly conspicuous by the



GEOLOGICAL-LONGITUDINAL SECTION OF THE UNITED VERDE MINE Jerome Ariz. SCALE 1 INCH TO 500 FEET

about 20 miles in an air line northeasterly from Prescott.

The town of Jerome, the commercial center of the district, and where the United Verde mine and smelters are situated, is accessible from Prescott Junction, on the Mineral Belt Railway, a distance of 26 miles over the U. V. & P. Railroad. The watershed of the district drains into the Verde river, at a distance of about 6 miles from Jerome. This stream meanders in a southeasterly direction through what is properly termed the northwesterly continuation of the great Salt River valley, the Verde river being a tributary of Salt river.

The general topography of the country is abrupt,

mentary and igneous rocks of the district, attended with a complex system of fracturing, of which the master fissures were north and south and the others transverse. An attendant phenomenon was the outbreking of volcanic rocks, principally basalt. There is much that might be said about the older rocks. I refer to the red sandstones and shales and the thin-bedded limestones, as well as the schists and slates and porphyries known as the "Basal Complex," upon which the former rest unconformably, as will be seen by reference to cross section before mentioned.

The so-called great fault fissure, in which the United Verde ore body occurs, is one of the north and south fissures produced at the time of the up-

presence of an immense gossan, or iron hat, as the Cornish miners would say. From the open cut on the south shoot (see drawing) many thousands of tons of oxidized gold and silver-bearing ores have been quarried out during the early history of the camp, the copper values having been leached and subsequently concentrated at greater depths. These shoots extend to or below the 700-foot level. The ores contained in them consist principally of the copper minerals: hornite, the black oxide of copper melanconite, a very hard impure variety of chalcopryrite, some red oxide (cuprite) and frequent efflores-

stroke, the area of the piston and the mean effective pressure multiplied by the number of revolutions per minute.

Pyritic Smelting.

True pyritic smelting has not yet been accomplished. By true pyritic smelting is meant the fusion of sulphide ores without the aid of other fuel than the sulphur contained in the ore itself. Still, runs of twenty-four hours at a time have been made without any outside fuel, but slight irregularities

we have available only 1291 calories per gram. The calorific power of carbon is 8080.

Attempts have been made to devise furnaces which would utilize the heat of the two sulphur atoms, but the system of larger charging is in general use.

The regular use of a small amount of coke has been found beneficial, not only on account of the extra heat, but also because of its helping to keep the furnace charges porous. It will also keep solid until consumed, while the pyrite has a tendency to fuse and trickle down the air passages. A large volume of blast is used through numerous tuyeres of large area, and everything is done to make the process entirely an oxidizing one.

Since the pyrite is apt to fuse, it is kept in the furnace as short a time as possible, whence comes the use of a short ore column.

Hot blast is not essential to the process, but it tends to correct variations in the furnace, causing it to run more regularly, and is almost a necessity when highly siliceous slags are to be used, in order to keep them at a sufficient temperature to flow properly. Its advantages are: First, the extra heat it brings in causing less necessity for fuel; second, less fuel gives less consumption of oxygen, and so the oxidizing power of the blast is not reduced by forming CO_2 ; third, resulting from the higher oxidizing power of the blast will follow a higher sulphur content of the charge; fourth, it gives a more energetic action and increases the hearth temperature; fifth, cold blast will cause the temperature to rise in the shaft, while a hot blast will bring about a lower position of the fusion zone; sixth, the increased temperature will permit the use of more siliceous, hence cheaper, slags.

The advantages to be gained by pyritic smelting are enormous, and if the true process can be developed there will be no further fuel hills; as it is they are reduced more than half. There is no time wasted or skilled labor required in roasting, and the extra expense of building a roasting plant for the purpose of destroying the fuel which nature stored in the ore is avoided.—Journal Chemical and Metallurgical Society, South Africa.

The El Mundo Process.

TO THE EDITOR:—The El Mundo process consists of roasting at a low heat pulverized ore or concentrates, with such ingredients as serve to follow nature in her oxidizing work, but which this process accomplishes in from a few minutes to two hours. The principal ingredients used are common earth, sawdust, charcoal, unburned lime and nitre. No one ore requires the use of all these ingredients, but all ores require the use of one or more. The use of common earth serves two purposes, one to furnish a base into which the sulphur and arsenic goes and is again immediately set free, passing out as fumes; the second purpose is to furnish a cupel in which to absorb the fine gold from tellurium or other ores carrying fine gold and hold it in suspension until it can be brought in contact with mercury in amalgamation. The sawdust has two purposes, one to furnish carbon and the other hydrogen. The chemical combination formed by mixing the required ingredients with pulverized ore or concentrates and subjecting them to a heat of from 350° to 450° Fahrenheit, has the effect of quickly oxidizing all the base ingredients, and changing the gold and silver to metal where it exists otherwise. When there is either sulphur or arsenic present they both pass out as fumes. Zinc and lead become oxides and also pass out in fumes. The mass is roasted in an oven with free access of air from both sides. The flames pass under the ore. The importance of this becomes apparent when millions of particles of sulphurets can be seen hursting into bright sparks, filling the entire oven. With an overheat these hursting sulphurets, each containing a small particle of gold, would be carried out and scattered over the surrounding country.

The importance of the El Mundo process to the mining world is that any sized plant can be installed at the mine and all ores worked independent of transportation. The mine that produces but a few tons of concentrates per month can fire up an oven, roast what concentrates are on hand, feed the roasted ore back into the mill while crushing rock and amalgamate it the same as any other free milling ore. When the ore contains talc or other ingredients that would prevent crushing by stamp mills and concentration the ore can be crushed by rolls and the whole mass roasted. The cost of treating ore by El Mundo process is nominal.

THE INVENTOR.

[The above described process is said to possess merit, where it has been tried upon the ores of Tuolumne county, Cal. When divested of what seem to be its inessential features, it simply resolves itself into a process wherein oxidizing agents are employed, viz: charcoal, sawdust and nitre, in roasting pulverized sulphide ores. These ores may be the crushed material as it comes from the mine, or concentrates. The ores are roasted in an oven without draft, thus lessening the loss, in the form of flue dust, which is incident to all processes where the fire is



cence of blue copper sulphate or chalcantite. The mine is opened up by two main working shafts each 750 feet deep vertically. These are connected by levels which are in the deeper workings 100 feet apart (see longitudinal section).

Butte, Mont., Jan. 24, 1903.

The Science of the Flywheel.

Increasing the size of a flywheel will not increase the amount of work your engine will do, says Practical Engineer. The function of the flywheel is to produce a uniform motion. When the engine is "on the center" practically all the moving force of the engine comes from momentum of the flywheel. When the full force of the pressure is upon the piston this force is obliged to overcome the inertia of the flywheel. In this way the excessive force moving the engine is decreased and the defective force increased at the proper time by the momentum of the flywheel, thus insuring a proper regulation of speed. The capacity of your engine is equal to the product of length of

compel a blowout, and so partial pyritic smelting or the addition of some coke to the charge is used at present.

Matte smelting as defined by Lange being "the smelting of ores composed of, containing or giving rise to sulphides for the purpose of collecting their slimes in a less quantity of artificial sulphides," pyritic smelting can be considered as a division under matte smelting, in that the matting and smelting operations are carried on at the same time in the same furnace.

If we compare the relative heating power of carbon and sulphur we find that carbon is much the better fuel, but the combination of sulphur, if the heat can be utilized, is sufficient to retain all the products in a thoroughly molten condition.

When pyrite is roasted we find that one atom of sulphur is given off readily, but the other one clings to the iron much more tenaciously, and on its combustion we have to rely for our smelting heat, as the first atom is given off at the top of the furnace and is not available. If this could be utilized the calorific power of FeS_2 would be 1523, but with FeS as a fuel

MINING AND SCIENTIFIC PRESS

Electrically Operated Oil Circuit Breaker.

A few years ago most alternating-current switchboards were equipped with hand-operated knife switches. It is now found advisable to use some means of auxiliary control. This permits the actual current-switching devices to be located with regard to the general design of the station and a satisfac-

first at the main contacts and then afterward at a removable plug attached to the stationary contact which enters a hole on the movable contact.

Mounted on each circuit-breaker is a small double-pole, double-throw knife switch, which is used with the indicating and tripping circuits, and is operated by the motion of the levers of the circuit-breaker. The controlling and indicating devices consist of a controlling switch, an electro-mechanical, tell-tale indicator and a lamp. These are suitably mounted at the operating platform. A poly-phase overload relay, connected to series transformers in the main circuits, is provided for automatic opening. The controlling switch, which is of the drum type, has three positions, namely, "closed," "off" and "open." It will remain of itself in the "off" or the "open" positions only. If thrown to the "open" position, it will remain in that position when the hand is removed; but if it is thrown to the "closed" position, it will turn of itself to the "off" position as soon as the handle is free. In the "off" position it connects the control circuit, so that if the oil circuit-breaker opens, through the action of any of the automatic devices, the lamp will be lighted on the operating stand to attract the operator's attention. If the oil circuit-breaker is opened by the operator throwing the controlling switch to the "open" position, the lamp does not light.

The mechanism of the electro-mechanical tell-tale indicator consists of an electro-magnet, which attracts a pivoted armature through an angle of about 90°. Attached to the armature is a disc with a pointer, which indicates to the eye the "open" or "closed" position of the oil circuit breaker.

In the accompanying illustration the closing magnet is partly hidden by the overload relay. This operates on the principle of the single-phase induction motor. Each of the sectors swings between the poles of an alternating-current electro-magnet. Part of each pole is surrounded by a short-circuited strip of copper, which acts to retard the magnetic flux and thus produce a shifting field. This tends to move the counter-weighted sectors, which carry a contact, closing the tripping circuit of the circuit breaker. The two sectors are connected in parallel, and either alone will trip the breaker. The currents for their magnets are derived from the phases of the main circuit by series transformers.

The engraving shows the left-hand compartment closed by an iron door, the oil tank suspended in the middle compartment, and the right-hand compartment without the oil tank. The overload relay is just above the second brick pier from the right, and the tripping device just above the third pier.

The apparatus described above, known as the "Type C circuit-breaker," is manufactured by the Westinghouse Electric & Mfg. Co.

A Quadruple Horizontal Pump.

The pumping plant of the Iowa Mining Co., Fresno county, Cal., consists of a setting of four 5-inch Jackson horizontal centrifugal pumps, arranged to work singly or compounded. This plant, when compounded, delivers 1000 gallons per minute, at an elevation of 50 feet, through 1500 feet of discharge pipe with a pressure at the point of discharge of 115 pounds, and is used for hydraulicking purposes. This machinery is driven by a 62-inch Sampson water wheel. Another plant of this character is that of the Bay Counties Power Co., installed recently near Dobbins, Cal. This plant consists

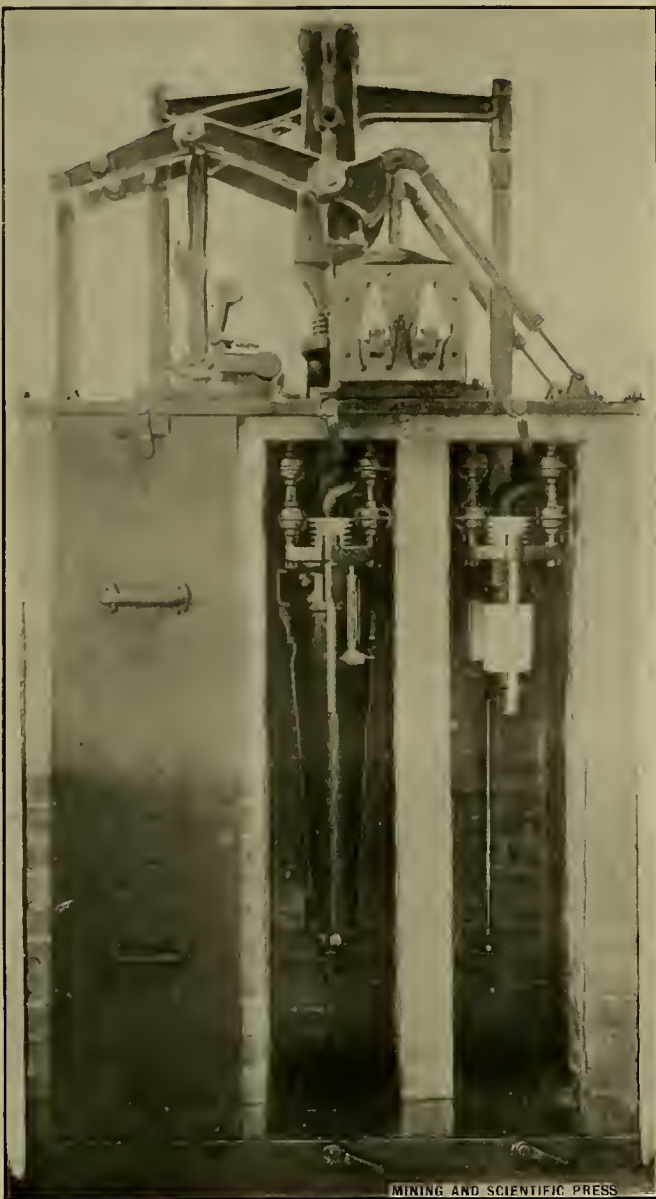
of two special 10-inch horizontal centrifugal pumps, compounded, is belt-driven and works under a head of 400 feet. The efficiency of this plant is stated to be 47%. During the past six months the Byron Jackson Co. of San Francisco, Cal., has supplied several pumping plants for irrigation and city water works east of the Rocky mountains. The Jordan River pumping plant near Salt Lake City, Utah, consists of four special 40-inch Jackson centrifugal pumps, having a combined capacity of 200,000 gallons per minute, each pump being belt-driven by one 100 H. P. electric motor. The pumping plant for the city of New Albany, Ind., recently supplied, consists of two specially compounded 8-inch centrifugal pumps and works under a head of 300 feet capacity of each 1400 gallons per minute. The plant for the city of Danville, Ill., consists of two special 12-inch horizontal centrifugal pumps with capacity of 5000 gallons per minute at variable heads. There is now in construction in the works of the company special pumps and apparatus for the cities of Forth Worth, Texas, and Elgin, Ill. Among city water works, pumping plants installed in California during the past few months are those of the city of Modesto, consisting of one 85 H. P. automatic steam engine, with special Jackson centrifugal pumps, which furnishes water for both domestic and fire purposes. The pumping plants for the cities of Woodland and Colusa consist of special Jackson high-head pumps driven by direct-connected electric motors.

No BRANCH of the iron industry carried on in the region of the Great Lakes receives more attention than that of ore handling and transportation. There is a continual increase in the capacity of ore carrying vessels. The development of mechanical appliances for handling ore from the docks to vessels and from vessels to docks has reached a most interesting stage. Where a few years ago most of the ore was moved by hand, or aided only to a limited extent by the employment of mechanical means, now great swinging cranes handle thousands of tons of ore daily, and to the casual observer it appears the limit of capacity and economy has been reached; but that this is the case is unlikely, for while the newest devices are the most complete, others of still greater capacity and operating economy are being planned.

The earliest data respecting mining shows that the necessity of engineering skill was recognized in the pursuit of the business. The few copies of Agri-cola extant in its ancient parchment binding has many rude wood cuts showing men at work underground, with engineers engaged in taking levels or establishing angles by means of plummet and level. Some of these cuts also show the methods of timbering employed in those "early days." In most cases the timbers were not framed, but were selected and cut with the forked limbs. These were used as posts which were employed to support caps laid on the fork. None of these timbers appear to have been framed.

The temperature of a furnace may be determined by means of a small carbon filament incandescent lamp, fitted inside a telescope mounted on a tripod some distance from the furnace, and pointed at an aperture. When no current is passing through the filament it appears as a black line against the background of white-hot firebrick. As more current is sent through the filament becomes brighter until when it attains the same color as the glowing furnace it is invisible. By a further increase of current it becomes visible again. The value of the current is read on an instrument, and a comparison with a table gives the corresponding furnace temperature.

The ore sent from Canyonville, Or., is chromite or chromic iron ore. It occurs in "bunches" or deposits of greatly varying size, some of them containing many tons of marketable ore. Often it is found in a series of deposits connected by small vein-like leaders. The standard ore is one containing 50% chromic oxide, and for each unit above that amount from 75 cents to \$1 is paid; but a much greater deduction is made for every unit below 50%. The average value of chromic iron is about \$10 per ton.

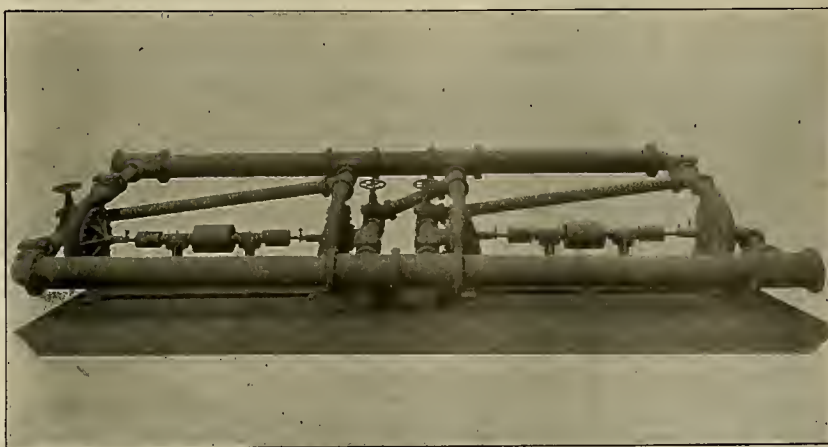


Automatic Circuit-Breaker.

tory lay-out of circuits and apparatus, and centralizes the control within a small space. It is to supply a compact and reliable device for rupturing high-tension circuits that the oil-break circuit-breaker has been developed. The accompanying illustration shows a three-pole, double-break, automatic, oil circuit-breaker, operated by electro-magnets. The circuit-breaker is erected in a masonry structure, with each pole and oil tank in a separate fireproof compartment. There are two stationary contacts to the pole, one connected to the incoming lead and the other to the outgoing lead of the same phase, each contact being mounted in a large porcelain insulator. In the illustration one of the porcelain insulators shows in the right hand compartment.

The insulators are fastened to a cast iron frame, which also supports the enclosing oil tank. The frame itself is supported from the soapstone slab at the top of the masonry walls by strain insulators. The movable contact for each pole consists of a U-shaped piece of copper fastened to the end of a stout wooden rod. In the closed position of the switch one of these U-shaped pieces electrically connects the two stationary contacts of each pole. The wooden rods are fastened at their upper ends to a common crossbar, which extends over the three masonry compartments and is supported by a system of levers giving a straight-line up-and-down motion. The crossbar is raised by the enclosing magnets, assisted at the beginning of the motion by a pair of balancing springs. The springs and the case containing the magnet are at the upper right-hand corner in the illustration. A toggle joint, shown at the left in the illustration, automatically locks this system of levers when the circuit-breaker is in the closed position.

The toggle joint is released by a blow from the tripping magnet, whereupon the crossbar, under the influence of gravity and a powerful spring, quickly drops, opening the contacts. The break takes place



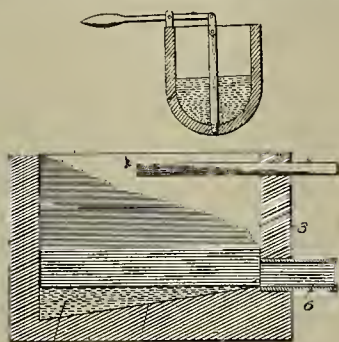
Quadruple Horizontal Pump, Iowa Mining Co., Fresno County, Cal.

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 20, 1903.

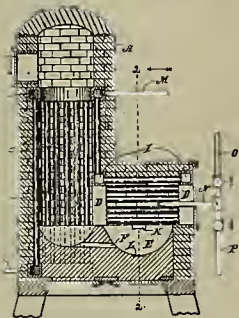
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF SEPARATING PRECIOUS METALS FROM MATTE.—No. 718,601; F. R. Carpenter, Denver, Colo.



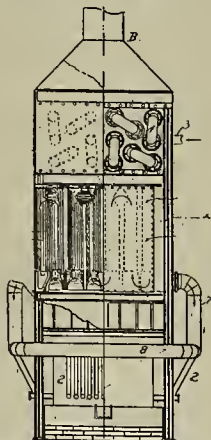
Process of separating precious metals from matte which consists in subdividing matte into small, smooth shot-like grains, and then leading matte, leading being maintained at temperature insufficient to fuse matte, but sufficient to cause absorption of precious metals from it.

SMELTING FURNACE.—No. 718,726; F. B. Petten-ill and E. Nicholson, Los Angeles, Cal.



Smelting furnace, comprising smelting chamber having composite lining around sides thereof, lining composed of spaced water tubes connected to hollow headers and firebrick therebetween; combustion chamber in communication with smelting chamber, having composite lining around sides and top thereof, composed of spaced water tubes connected to hollow headers and firebrick between tubes.

AIR HEATER FOR SMELTING FURNACES.—No. 718,755; J. L. Giroux, Jerome, Ariz.

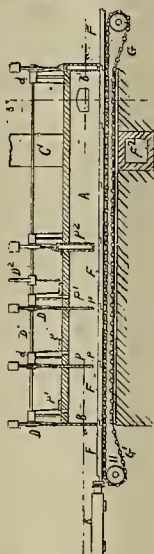


Combination with smelting furnace of horizontal heating coil in upper portion of furnace, series of vertically disposed pipes surrounding interior of upper part of furnace, and connected with terminal of heating coil, and pipes of series made divergent from one end to other, and having alternate ends connected to form tortuous passage, inlet by which air is admitted under pressure at one end, outlet from opposite end, and connection between outlet and surrounding trunk or bustle pipe, and pipes leading from trunk to tuyeres of furnace.

GOLD EXTRACTING PROCESS.—No. 718,633; T. B. Joseph, Mercur, Utah.

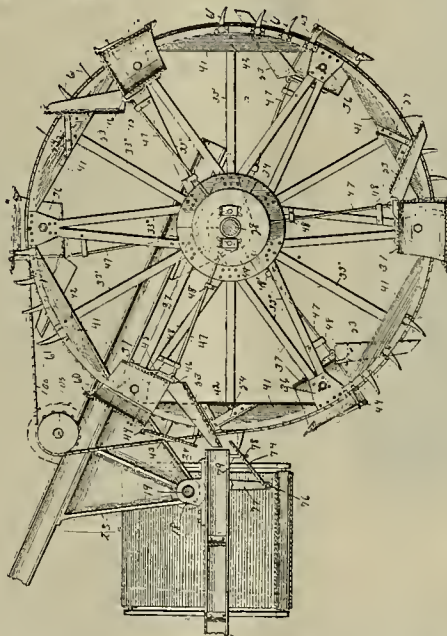
Process of extracting gold and silver from ore containing same in suitable condition, which consists in subjecting ore to leaching action of solution of water, cyanide of potassium, hydrate of calcium and carbonic acid gas, gas being forced into leaching solution simultaneously with compressed air.

FURNACE FOR TREATING METALS.—No. 718,760; H. D. Hibbard, Plainfield, N. J.



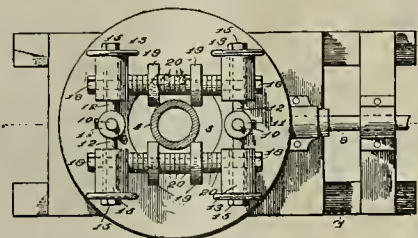
Furnace for treating articles of metal, comprising elongated heating chamber having near one end at one side heating means and at same end on opposite side outlet flue for products of combustion, and plurality of partitions between hot end of furnace and its opposite end, partitions being movable into and out of path of charge, whereby series of consecutive heating zones may be obtained having temperature gradually increasing from zone to zone without interfering with passage of charge.

EXCAVATING MACHINE.—No. 718,854; D. W. Miller, Chicago, Ill.



In excavating machine, combination with suitable supporting frame, of excavating wheel of rigid construction provided with series of peripheral scoops arranged with their longitudinal axes perpendicular to radii of wheel and located at periphery thereof, each scoop having open front end and provided at rear with swinging door; means for automatically releasing several doors of scoops at predetermined point in rotation of wheel, fixed guide apron mounted in rear of each scoop and adapted to direct excavated material downwardly and radially outward, stationary receiving apron mounted upon supporting frame in position to receive excavated material from moving aprons, and conveyor belt arranged to receive material from stationary apron.

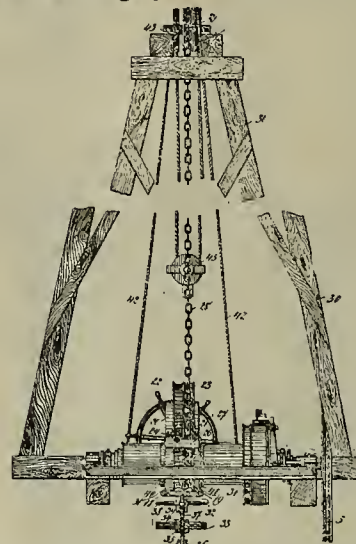
GRIPPING DEVICE FOR WELL BORING APPARATUS.—No. 718,937; H. G. Johnston, Corsicana, Texas.



In well drilling apparatus combination with rotary plate or table, means for rotating same, means for gripping well tube so as to rotate same without interfering with its endwise movement, consisting of longitudinally apertured blocks, two parallelly ar-

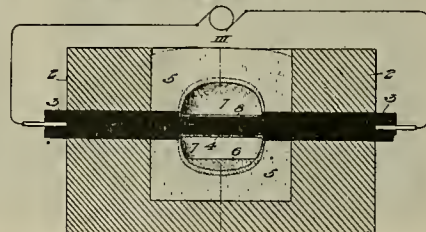
anged screw-threaded shafts carried by rotating plate, each one of which is provided with a centrally, vertically apertured enlargement which rests on boss carried by plate, which boss is provided with reduced portion or pin which extends through vertical aperture of enlarged portion of screw-threaded shafts, internally threaded sleeve nuts carried by shafts and also extending through blocks, sleeve nuts being provided with enlargements or heads to bear against the blocks, plain shafts extending at right angles to threaded shafts and extending transversely through blocks and provided with nuts on outer ends to hold them in position on blocks, gripping jaws or rings carried by plain shafts and constructed to rotate on same, and blocks arranged on plain shafts for properly spacing gripping jaws.

DEEP-BORING MACHINE.—No. 718,876; V. Petit, Stryj, Austria-Hungary.



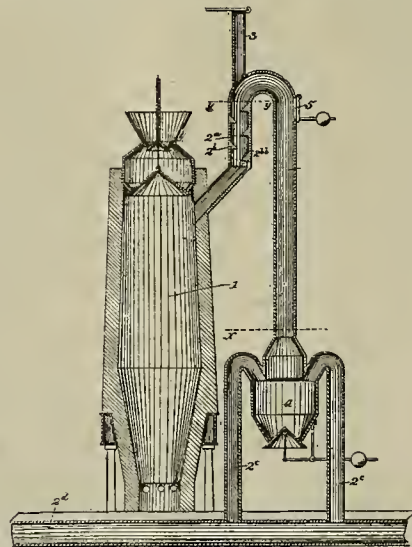
In well boring machine combination of boring tool, vibratory structure, means for vibrating structure, flexible device carrying tool at one end, coating rotary gripping members engaging flexible device and mounted in structure, worm wheels formed one with each gripping member, and worm engaging worm wheels.

METHOD OF REDUCING METALLIC OXIDES.—No. 718,891; E. G. Acheson, Niagara Falls, N. Y.



Method of reducing metallic oxides, which consists in placing in proximity to electric conductor oxide to be treated mixed with reducing agent in proper proportion to reduce oxide to elemental state, placing between conductor and such mixture layer of pre-formed refractory carbide and passing electric current through conductor.

BLAST FURNACE.—No. 718,945; L. Bentley, Columbus, Ohio.



In a blast furnace, downtake, upwardly leading portion therein, and horizontally extending projections on inner side of upwardly leading portion to obstruct passage of dust particles through upwardly leading portion.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

W. E. Thorne, of Denver, Colo., has gone to Forty Mile to install and manage a hydraulic mining plant on the North Fork of Forty Mile creek, 95 miles above its confluence with the Yukon, for the Big Bend M. Co. of Chicago, Ill. An unusual condition is found at Big Bend. This portion of Forty Mile creek has a light grade, and has made a horseshoe shaped bend, the distance around the bend being 2½ miles. A trench has been cut across the neck 70 feet in length which with a fall of 23 feet drains the bend completely. A 5-mile flume from Hutchinson creek will deliver 3000 inches of water for hydraulicking under 300-foot head. The gravel is stated to average 8 feet deep, and 100 yards wide around the bend. Owing to the flat grade the tailings will be handled with hydraulic elevator. The company has a sawmill on the property and is getting out lumber for the flumes. Mr. Thorne expects to reach Dawson by Feb. 15, and all machinery and supplies will be taken in during winter as transportation is difficult and uncertain when the ice is gone.

The Jualin M. Co. will begin this spring to mine in their lower levels, says Superintendent Haggatt, and the shaft sunk to 500 feet. The Jualin mine is at Berner's bay, near Juneau.

ARIZONA.

COCHISE COUNTY.

Superintendent J. Mitcheson says development will be resumed on his mines, 1 mile from Gleeson.

Manager G. M. Henry, the Dragon M. & S. Co., in the Dragoon mountains, 18 miles from Tombstone, says sinking the shaft will be resumed and go down to 750 feet.

Two and one-half miles from the Modern, near Bisbee, Jones, Erickson & Davis have struck ore assaying 20% copper and \$1 in gold, in a tunnel 50 yards from the road. They have a group of six claims.

W. J. Burner of Ramsey canyon is driving a tunnel to develop his three copper claims on the right fork of Ash canyon. Campbell & Cummings are developing a group of three gold claims in Ash canyon. They also have copper prospects at the head of Copper canyon. Mrs. J. W. Stump owns three gold claims above Lefebvre's camp, out of which her lessees last week made two shipments of \$100 ore. The shipments were made from the east location, the ledge averaging 36 inches in width.

The Marquette & Arizona M. Co., near Bisbee, will put in an engine and hoist with a capacity of sinking 1500 feet.

At the Golden Era, near Bisbee, the shaft is down 125 feet.

The Copper Queen M. Co. at Bisbee has let a contract for 1000 feet of 10-inch air pipe.

It is expected that the plant at Benson will be completed by March 1.

GILA COUNTY.

The Gray at Globe, belonging to the United Globe or Phelps-Dodge system, is flooded, the pumps being under 200 feet of water, says the Bisbee Review.

The 30-ton concentrator at the Yo Tam-hien mine, near Globe, is nearing completion and an aerial tramway 900 feet long and 300 feet of surface track will be put up.

Superintendent E. H. Benson of the Black Warrior C. Co., near Globe, says he is putting in the foundation for a leaching plant which will include six lead-lined tanks of fifty tons capacity each.

GRAHAM COUNTY.

Last week the drift being run from the incline shaft of the Standard copper mines, near Clifton, cut a lead of glance ore 19 inches in width.

The Sierra de Oro G. M. & M. Co. of Arizona has been organized by Crawford, Potter & Morrow to develop a group of gold claims in the Greenlee district, 4 miles above Clifton. There are fifteen claims in the group and a millsite on the Frisco river, containing in all 305 acres.

MOHAVE COUNTY.

(Special Correspondence).—Owners of the Burro mine, at Owens, on Burro creek, after an idleness of many years, are building a wagon road from Sandy river to the mine, a distance of 8 miles, and expect to do considerable development work and erect a mill; J. P. Wallace is manager.

W. H. Chapman of Owens has a group of five claims, 1½ mile from the Big Sandy

river, showing good values in gold, silver and some copper.

Kingman, Jan. 19.

(Special Correspondence).—Chloride, 27 miles north of Kingman, is reached via the Arizona & Utah Railway. The veins here are fissures running northwest-southeast—the mineral belt commencing near Cerbat and Stockton Hill and running through Mineral Park and Chloride to White Hills, a distance of 40 miles. The camp at Chloride was worked thirty years ago. The surface ores were bailed to different points on the Colorado river, going via Lower California to San Francisco—later via Yuma to San Francisco. The first mill built in the district, at Mineral Park, charged \$50 per ton for treatment, paying 80% of the value, and at that time there was a State tax. At Mineral Park the K mine has a tunnel in 50 feet and a crosscut 30 feet. Ore runs \$80 per ton. The King mine at Mineral Park has a tunnel in 80 feet and taking out ore running 600 ounces silver. The ledge is 10 inches wide.

The Oro Plata M. & M. Co. at Campbell are building a 40-ton concentrating mill. Same will be ready about February 10. The mill is being erected by E. E. Stephens. Machinery used will be one crusher and five concentrators, 45 H. P. boilers and 35 H. P. engine. The company owns four claims carrying gold and silver. Four hundred thousand dollars has been taken from the property and shipped in former years. They have a shaft down 250 feet and a 900-foot tunnel. J. D. McNab is manager; H. J. Woolcott, of Los Angeles, Cal., president.

The Queen Bee, near Mineral Park, has the new shaft down 70 feet and are putting in a gasoline hoist. At Chloride the Chloride G. M. Co. has a lease on the Fourth of March and the Samoan; L. Hoffman, president and general manager; J. H. Hoffman, Marble, Colo., secretary; C. Hoffman, Enterprise, Kansas, vice-president. All royalties apply on purchase price. These properties were worked for a time by leasers, who took out only high grade ore. No work has been done since 1897. All has been dead work since November. The shaft on the Fourth of March is down 100 feet and sinking to 200 feet, when they will install a hoist. The ore is sulphide, carrying gold, silver, iron and lead, running from \$50 to \$100 per ton. Twenty thousand dollars of ore was taken out by the leasers. The vein varies from 8 inches to 3 feet. They have shipped three carloads of ore to the smelters. The main tunnel on the Samoan is in 400 feet with drifts and stopes 150 feet. The upper tunnel is in 300 feet. They will drive the lower tunnel 50 feet farther and upraise the winze from upper tunnel. The mines are 3 miles from the railroad and near the summit of the Wallapai range. Twelve men are employed.

Kingman, Jan. 20.

(Special Correspondence).—The Tennessee mill, one-half mile from Chloride, operated by the Hualapai M. & D. Co., is handling 100 tons of ore per day. Shaft No. 2 is down 600 feet. The Elkhart, one-half mile north of the Tennessee, has an incline shaft down 500 feet, from which Superintendent C. Barmore, Jr., is driving a crosscut by hand and expects to get water enough for the mill and other purposes. The mill has been overhauled and additional machinery put in. The ore hoisted from the mine is taken on an incline tramway up to the mill on the north. The mill contains a crusher, one set 14x27 and one 16x30 rolls, trommels, three jigs and two concentrators, requires four men, and has a daily capacity of 125 tons. Ore is galena, carrying gold and silver. Oil is used for fuel. The Schuykill group, south of the Elkhart, has been closed down for several months. Chloride, Jan. 21.

Manager J. P. Wallace says he will install a mill on the Burro mine, near Kingman.

PIMA COUNTY.

J. P. Owens, of Owens, Tex., has sold the Tres Amigos gold mine and the Sorrel Top mine, of the Oro Blanco mining district, to Pettigrew and associates.

Manager J. B. Stetson, the California Co., has 40 men at work opening a 6-foot ditch 5 miles long, near Greaterville, to the placer mining district. Three miles of 24-inch pipe will be laid and a reservoir constructed on the east slope of the Santa Ritas. Greaterville is 40 miles southeast of Tucson.

PINAL COUNTY.

The Fernando M. & D. Co. of Los Angeles, Cal., are developing a group of five mines, 45 miles north of Tucson.

SANTA CRUZ COUNTY.

Ore is being shipped from Washington camp to the smelters.

YAVAPAI COUNTY.

Superintendent B. Blanchard of the

Iron King mine, near McCabe, says forty men are at work and the 200-ton plant will be in operation next month.

A hoist will be set up near the 200-foot shaft of the Leland M. Co., near Prescott. E. Wells is superintendent.

J. Kompatscher and L. Martin claim to have rediscovered the telluride vein in the Montgomery mine near Prescott.

L. Thomas and Gibbons Bros. are building a mill on their Contention mine, near Prescott. Their ore runs \$15 per ton gold.

Manager W. D. Wasburn, the Sultan mine, near Prescott, says they will install a reduction plant and hoisting machinery to develop the property. H. L. Montague is superintendent.

Superintendent W. H. Ferguson has men at work developing the Hurricane mine of Douglas, Lacey & Co., 8 miles from Prescott.

The Mercantile M. Co., near Prescott, will put in a steam hoist.

The Miners' & Prospectors' D. Co. is opening up a recent find in the King of the West mine on Little Cripple Creek, one of a group owned by this company. An 8-inch stringer on the hanging wall side of the main vein, says Manager J. H. Elise, mills \$50 per ton. The ore of the main vein is in red granite, and is 30 feet wide; average value \$6 per ton.

The President mill is in operation on ore from a 4-foot vein with an average value of \$5.

Little Cripple Creek (Arrastra creek) is 3 miles from Placitas and 2½ miles from Hassayampa creek.

A. Ross, superintendent the President G. M. Co., and C. McKenzie have handed some of their holdings to Eastern men.

Superintendent Treadwell, the George A. Treadwell M. Co., near Jerome, says he will resume sinking the shaft on the Brookshire claim. They are shipping ore from this claim to their smelter at Mayer. A diamond drill will be put to work on the Cliff and Brookshire groups.

Manager G. W. Hull says he will put twenty more men at work on the ore bodies in the Hull mine cut by the Dillon tunnel, near Jerome.

O. L. Geer, of Martinez, says he will build a 50-stamp mill for his mines next month.

President F. Jager, the Model G. M. Co., says the company will spend \$100,000 for machinery, and in development of the mines. The capacity of their mill at McCabe will be increased.

The Verde King has men at work near Jerome sinking shaft.

CALIFORNIA.

AMADOR COUNTY.

Connection has been made on the 2625-foot level between the north and east shafts at the Kennedy mine, near Jackson, by an upraise from the west drift from the east shaft. The headplates for the hoist at the east shaft are in position.

At the Bay State, north of Plymouth, they are sinking the shaft 300 feet deeper from the 800-foot level.

The shaft at the Onelda mine, near Jackson, is being sunk below the 2000-foot level and is down 2075 feet.

The Cherokee Gold Dredging Co. is operating a dredger on the Mokelumne river.

Superintendent C. R. Downs of the Bunker Hill M. Co., north of Amador City, says a 20-stamp mill will be built. The 1400 level has been driven 150 feet on ore which averages 6 feet in width and will mill \$10 per ton. The vein in the 800-foot level has been exposed for several hundred feet. A station is being cut at the 1200 level, and, if development on this level warrants, the mill will be increased to forty stamps.

Work was resumed this week in the Centennial mine, near Drytown, after being idle eighteen months. L. Gross is superintendent.

The Amador Phoenix Co., near Jackson, is negotiating with the owners of the property for an extension of the bond.

An 8x10 double hoisting engine is being set up at the Edinburgh G. M. Co.'s shaft, near Jackson. The double-compartment shaft will be timbered to the tunnel level by the time the hoist is completed, when sinking will be resumed to the 500 level.

Manager Horn of the Horn mine, near Defender, will resume operations next week.

A dump has been sunk in the Shenandoah mine at Plymouth below the 1000-foot level, and drifting begun on the 8-foot ledge. Though the upper levels were dry, water has been found at the 1000-foot level.

It is reported that the Gowanus mine, east of Indian creek, owned by E. C. Brown of Plymouth, will resume.

Sutherland Bros. have their shaft on the Ochre lead, east of Plymouth, down 60 feet.

E. S. Potter has sold a one-fourth in-

terest in the Plymouth Rock mine, on the east bank of Indian creek, north of Plymouth.

It is reported the Zeila mine, near Jackson, will resume March 1.

CALAVERAS COUNTY.

The Royal Con. Co., Ltd., J. C. Kemp van Ee, superintendent, at Hodson, are building a 120-stamp mill in addition to the forty stamps now in operation. They are installing a hoist and an electric trolley line to haul the rock from the mine to the rock crushers and the mill, 1500 feet. Four cars will be used, having a capacity of five tons each. The hoist will be operated by compressed air, the compressor being driven by electric power already installed. The mill is on the crest of a bill, the batteries from sixty stamps running to each slope. Between these is the ore bin, with a capacity of 3000 tons, and the rock breakers. It will require 800 H. P., which will be furnished by the Stanislaus Light & Power Co. and Standard Electric Co.

Rich gravel is reported being hydraulicked at the Old Stiff mine, at Balaklava hill, south of Vallecito.

The Angels Record says Superintendent Langford of the Melones M. Co., at Melones, will put in a cylindrical ball mill to regrid the sulphides for cyaniding.

South ½ mile from the Royal mine, at Hodson, the Wilbur-Womble mine has at work twenty-five men. This company has a 6-stamp triple discharge mill and is putting in nine more stamps of the same type. The shaft is down 300 feet. Electric power is being substituted. E. A. Braddock is superintendent.

The Nelson M. Co. turned the water in their ditch last week and the giant is in operation at the mine near Calaveritas.

E. C. Rigney is putting in the flumes of the O'Neil creek ditch. The Eagle M. Co., operating the Treat claim near Cave City, has shut down on account of scarcity of water. Dixon & Edmunds are washing tailings on the Gunter mine at Washington Ranch.

Below Murphys the Lucky Jack, owned by Richmond, Mitchler & Ober, is being worked by tunnel. Adjoining this is the Tenderfoot mine, owned and operated by Richmond & Shepherd, who are erecting a water wheel.

The Queen mine, owned by Shaw Bros. of San Domingo, has been bonded to Eastern men.

At Douglas Flat the Forty nine M. Co. are sinking a three-compartment shaft. J. M. Evans is superintendent.

It is reported that operations will be resumed on the Manitou gravel mines at Vallecito.

CONTRA COSTA COUNTY.

The Contra Costa Oil Co. will drill a well on their land, 8 miles from Antioch, and one-quarter of a mile from the first well.

EL DORADO COUNTY.

There are twenty men employed at the Golden Gate mine, near Placerville.

The Whim mine at Fairplay has suspended work till spring. Superintendent J. J. Leventon, the Ellen Taylor mine, reports having struck a bed of pay gravel.

President Drury of the Golden Gate M. Co. says they will put in an air compressor and power drills at the mine near Placerville.

N. H. Burger, representing Eastern men, has bought the placer ground of W. P. Frick and G. W. Mauk, near Grizzly Flat. The mines were formerly hydraulicked, but the new management is running a tunnel to tap the channel and will work by the drift method hereafter.

GLENN COUNTY.

The well of the Washington-California Oil Co. at Fruto will be put down 2300 feet.

HUMBOLDT COUNTY.

G. Henderson, of Oakland, Cal., is interesting capital in the establishment of an electric plant on Klamath river, to develop 5000 H. P. The proposed plant will cost \$500,000 and the electric power will be distributed to mines on the Klamath and also taken to Eureka and other towns in that part of the State.

KERN COUNTY.

(Special Correspondence).—The Breadwinner G. M. Co., recently organized in Los Angeles, Cal., has secured the Old Cowboy mine, near Caliente, Amalie district. A mill will be built of forty tons capacity which will later be increased to 100 tons. It will be an electro-chemical process, which is said to work these ores economically. It is reported that 30,000 tons of pay ore is in sight.

The Gold Peak M. Co. at Amalie have several properties upon which work has been started. C. D. Porter of San Francisco, Cal., is in charge. The principal work has been done on the Red Rover

tunnel, which is in 400 feet. High-grade ore has been shipped at an expense of over \$30. Some of this ore ran as high as \$300 to the ton.

The Mines Ex. & Dev. Co., with offices in Los Angeles, Cal., are developing a group of twelve mines in this county and one at Placerville, Cal., running \$100 per ton.

Callente, Jan. 27.

It is reported the Kern River Oil Co. will sink more wells, and 1½-inch casing will be used in one.—The Eastern Con. Oil Co., which has six wells in the Kern river oil fields, has decided to put down four more.—The Shamrock well is flowing. The daily production for the past month has been 600 barrels.—The St. Paul & Sunset Oil Co., near the Queen wells, has finished its first well.

The Mountain Boy Oil Co. will resume operations in the Midway district.

Shipments from the McKittrick field are averaging fifteen cars daily, and more would be sent out if more cars were obtainable. The Sedalia and California, in the McKittrick field, has three completed wells pumping, and is at work on two more.

The King Refining Co., on the Alladin property in Kern river district, is setting up its stills.

The directors of the Old Glory Oil Co. have filed a petition in the Superior Court at Bakersfield for permission to change the name of the corporation to Old Glory G. M. Co., as there is an Arizona corporation of the same name doing business in this State.

S. J. Edginton, superintendent of the Del Rey Oil Co., near Bakersfield, is putting in a 7½-inch pipe line, from the company's property to the railroad. The company is cleaning out its wells and will begin pumping. Other wells will be drilled.

The Alta Oil Co. is down 700 feet in its well northwest of McKittrick.

LOS ANGELES COUNTY.

(Special Correspondence).—The After Gold M. Co. are doing development work on their mines in the San Gabriel canyon, above Azusa. Thirteen placer claims and twenty-three lode claims have been consolidated. The Lillian claim has a ledge 60 feet in width, free milling.

G. M. Cummings reports locating a placer claim in the upper San Gabriel canyon, yielding 16 cents to the pan.

Los Angeles, Jan. 26.

The Central Oil Co. at Whittier has put two more wells on the pump. No. 13 has been deepened, getting 120 feet more oil sand.

NEVADA COUNTY.

The Reddik M. Co. has sold its 10-stamp mill to the Oustomah M. Co., who will move it to their Pennsylvania mine, north of Nevada City. F. P. Williams is superintendent.

PLACER COUNTY.

The owners of the Pine Hill mine, 14 miles east from Auburn, have completed their 10-stamp mill, air compressor and steam plant. The main shaft is 180 feet deep, with a 400-foot crosscut, and they are breasting a 15-foot ledge of ore which assays \$10.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Federal G. M. Co., organized by C. H. Thompson, L. C. Gilliam and others, have secured the A. G. Campbell properties at Vanderhilt, in the eastern part of this county, consisting of seventeen claims, fifteen of which are patented. Twenty-five men are employed on development. Three hoists have been repaired, the 10-stamp mill being in good condition. The ore shoot on the 200-foot level shows a length of 205 feet, averaging 7 feet 8 inches in width, and 11 feet at its widest part, the ore assaying an average of \$12 per ton gold.

The Gold Bronze mine, owned by J. M. Hall and others, adjoining the Gold Bar mine of the Federal G. M. Co. at Vanderhilt, was working forty men, but a strike is on. Before the troubles regular shipments of bullion were made. It is reported that an ore shoot 4 feet wide was found in new workings.

Manvel, Jan. 26.

SAN MATEO COUNTY.

Frick & Parker are still drilling their well in the Tunitas. The Guiberson well is down 1200 feet.

Mahoney & Youle have the well of the San Mateo Oil Co. near La Honda cleaned and drilling resumed, being down 1200 feet.

SHASTA COUNTY.

It is reported that the storm in the early part of the week damaged the smelting plant at De Lamar to the extent of \$3000.

An air compressor and drills, to be driven by electricity, will be installed on

the Afterthought group, near Bellavista.

E. C. Christiansen, superintendent of the Gold Dollar group of mines in the Mule-town district, says preparations are being made to install a 10-stamp mill and concentrating plant on Clear creek.

The strike of the smelter men and miners at Keswick and Iron Mountain, that for four months has been in force, is at an end. At a recent conference between Manager Wright of the Mountain Copper Co. and Manager Lewis of the strike committee, it was agreed that the representatives of the Western Federation of Miners would declare the strike off and the men go to work, the company to post a notice that the company would not discriminate between union and non-union men. The notice posted is as follows: "Notice to Employees.—The Mountain Copper Co. has not and will not discriminate against any man because of his affiliation with labor unions. As soon as the company is assured of the maintenance of peaceable and orderly conditions in its neighborhood, it will resume its operations as rapidly and on as large a scale as other conditions will permit, and will entertain any man's application for employment without regard to his membership in any union. In taking on men, all other things being equal, it will prefer those whose skill has been proven by long service in its employment, and those who, being married, have families and homes in the neighborhood, and who would be, consequently, the most seriously injured both in respect to capital and income by failing to obtain employment at Keswick. Under no circumstances will the company employ any man who has engaged in unlawful violence toward its property or its employees."

Work will also be resumed on the Cow Creek power plant by the Northern California Power Co. The Texas mine will start up and small mines east of the river are making preparations to resume work. C. Raymond one day last week took \$200 from a placer claim he is working on Rock creek, 4 miles north of Redding.

C. J. Hammond has sold to J. D. Hammond and W. F. Aram for \$10,000 the Crown Point and Midnight quartz claims in Centerville mining district, near Redding, says the Searchlight.

Superintendent H. C. Woodrow of the Texas mine, near Whitehouse, says operations are resumed and ore is being shipped to the smelter at Keswick.

SISKIYOU COUNTY.

The compressor at the Keen & Co. quartz mine at Callahans is in operation and quartz is being broken for their cyanide plant.

A. C. Brokaw has an air compressor run by water power in operation at his quartz claim at Hull gulch, Quartz valley.

D. McCook has been running his quartz mill at the forks of Humbug on quartz from the Punch Creek mine, but the roads are in bad condition for hauling more from the mine.

The Michigan company working the Barton mine at Buckeye Bar, Klamath river, has resumed.

Garner, Quigley & Eastlick have resumed at their hydraulic mine at Oro Fino, using a 500-foot head of water.

TRINITY COUNTY.

At the Headlight mine Superintendent Fletcher has nineteen men at work.

The Integral quicksilver mine at Integral, ½ mile from Cinnabar, has twenty-five men at work. Two furnaces are in operation. The shaft is down 400 feet. F. Mahan is superintendent.

At the Cinnabar mine two men are working on the dump ore.

Superintendent H. Wilson of the Chloride-Bailey mine, near Dedrick, has 100 men at work. This company also owns the Jenny Lind and Maple mines, which it is preparing to work. Work has begun on a gravity tramway 2½ miles in length from the Jenny Lind and Maple to the new mill. This tramway will be equipped with twenty cars and have a capacity of fifty tons per day. It will also be used in transporting timber and supplies to the mines. Ore from the Chloride-Bailey is being transported to the mill by a wire tramway carrying 200 buckets, having a capacity of seventy-five tons per day. On this property is an ore body 4 feet wide on the bottom, with seven stopes running east and west from the lower levels. Last week \$17,000 in bullion, the result of four weeks' run, was shipped. Thirty stamps are dropping and twenty more will be added in the spring.

The Nevada and California quartz mines, 2 miles above Trinity Center, have been bonded to H. Hume for \$20,000. This property shows a ledge 12 feet wide which assays \$6 per ton. There are 600 feet of tunnel on the property.

A. Belli, owner of the Grutil quartz mine at the mouth of Coffee creek, says he has 200 feet of tunnel, with two parallel ledges, one 10 feet and the other 12

feet wide, with 100 feet of backs, and that the ore mills \$5 per ton free gold. The tailings are being saved for reduction.

Ruggles & Son, owners of the Nugget quartz mine on Coffee creek, have their 5-stamp mill dropping.

M. W. Collins, an owner in the Texas Jack mine on South Fork of Indian creek, says they are running on the ore body in the lower tunnel and the ledge is getting larger. The mill is in operation on \$30 ore.

Superintendent G. Lowden, the Three Peaks mine on Coffee Creek near Carrville, says ten stamps will be added to the mill this spring.

Manager W. B. Gester, the Bully Cboop mine, near Ono, Shasta county, has sixty men at work and ten stamps dropping in the mill, crushing sixty tons of gold-quartz daily.

TUOLUMNE COUNTY.

(Special Correspondence).—The water company claims the condition of snow on the range insures water for a long run this season.

At the Woodside mine, near Columbia, they are breasting gravel from a channel recently struck, which they will wash when the ditch is completed. Surveys have been made for a shaft on the north end of this property to develop the channel discovered on the Ranch mine, adjoining the Richards mine. Superintendent Muir has a few men on development work and taking out gravel. At the Ranch mine a bolting plant will be put up, a pipe line laid from Davies hill and a 75-ton washer installed, says Superintendent Stanford.

The Horseshoe Bend mine is working on their ditch and will resume work at their shaft next month. W. L. Holmes, managing owner the Altadena—John Royal mines, bonded the Royal claim in Experimental gulch this week. The property has a vein of low-grade quartz, though a \$40,000 pocket was taken out some years ago. The Mountain Lily mill is running on high-grade rock, and Lessees St. Clair & Woodruff are developing a claim near the Densmore mine.

Columbia, Jan. 23.

(Special Correspondence).—Wm. L. Holmes of Detroit, Mich., is here looking over his properties—the John Royal mine, near Columbia, and the Altadena mine, 4½ miles southeast of Columbia, on Yankee bill. Ten-stamp mills are under construction at these properties; that at the Altadena will begin operations in two weeks. A new hoist is also being put in at each of the properties. The vein on the John Royal mine is 8 feet wide, averaging \$10 per ton. Mr. Holmes will remain here for some months. W. G. Phipps is superintendent.

Columbia, Jan. 25.

Superintendent C. L. Uren the Eagle-Shawmut mine, near Chinese Camp, says a compressor will be added to their plant next month.

A 2-stamp prospect mill will be erected on the Fleming mine near Jamestown, owned by P. B. Smith.

Articles of Incorporation of the Horseshoe Bend M. Co. have been filed in Sonora. Principal place of business, Portland, Me.; capital stock, \$1,500,000; W. H. Gulliver, G. W. Gallison, W. W. Dresser, E. S. Taylor and W. B. Libby, directors.

At the Confidence mine, at Confidence, N. Carmichael, manager and superintendent, has twenty stamps dropping, crushing three tons per stamp. The mill has been remodeled, doing away with the concentrators. After amalgamation, hydraulic sizers are used and the pulp cyanided. The slimes are passed through filter presses.

Lack of water has suspended operations at the Star mine, on Rose creek, near Columbia.

The shaft at the Dutch mine, at Quartz, is down 1500 feet and sinking continues.

The ditch at the Grizzly mine, near Carters, has been cleaned out and the mill overhauled. A shoot of ore has been struck on the 900-foot level.

The Scott-Dow M. Co. (Black Oak), at Soulsbyville, has forty stamps dropping on ore from the 1200-foot level, and ninety-five men are at work. The ore is crushed through a 60-mesh screen, one ton per stamp being the output. C. S. Dow is superintendent of the mill and cyanide plant; W. G. Scott is superintendent of mine.

Superintendent W. L. Turner of the Rawhide M. Co., near Jamestown, has forty stamps dropping in the Rawhide mill and sixty at the App, with 225 men at work. The concentrates from the App mill are bailed to the Rawhide chlorination works.

J. H. Gilmore, superintendent of the Mt. Jefferson, has a 5 H. P. engine and a pump in operation in Groveland creek supplying water for the hoist and mill. Ore is being taken from the 300 and 400 levels and twenty stamps are dropping.

Daily shipments of sulphides are made, and the shafts and drifts have been retimbered.

The shaft on the Mountain Belle, near Soulsbyville, has been retimbered and machinery, including an air compressor, will be put in.

The roller mill in operation at the Sunnyside, near Arrastraville, will be replaced by a 10-stamp mill.

Superintendent Bower of the Mountain King says the road is completed to the property from the Keltz road, 1½ mile, saving 7 miles travel, via Confidence.

H. Ditts has bought a one-fourth interest in the Golden Ribbon mine, 2 miles west of the Buchanan.

The Piedmont G. M. Co. has bought the Sweeney quartz mine at Quartz mountain.

G. G. Grant of Carters has bought a group of placer claims on Jawbone ridge, near Jawbone creek, 10 miles east of Carters.

L. H. Laughlin of Quartz Mountain has bought a one-half interest in the Cibola claim, ½ mile distant from Stent.

The Manzanita G. M. Co. of South Dakota has bought the Mayflower and Extension, Red Haw, Lena Belle, Iron Cloud and Young America, together with the millsite, mill and improvements, 1 mile southwest of Carters.

COLORADO.

BOULDER COUNTY.

Pumping is resumed on the Republic oil well near Boulder.

At the Denver tunnel of the Denver T. & M. Co., near Wall Street, an air compressor and drills will be installed.

The United States Gold Co. has incorporated at Eldora. The company owns 300 acres of mineral ground southeast of the Con. Copper Co.'s holdings. They will drive a tunnel to cut their three veins in a distance of 1200 feet at a depth of 1000 feet. J. F. Rowell is manager.

CLEAR CREEK COUNTY.

Shipments made from the Mandota, near Silver Plume, last week included thirty-five tons of lead concentrates from the mill and twenty-five tons of ore from the mine, says Manager Old.

The Newhouse tunnel, near Idaho Springs, will be driven ahead to reach the Saratoga mine, says Manager Hanchett. It will have to be driven 1500 feet from the present heading, which is now in 3 miles. The Saratoga mine needs such connection, both for mining and drainage. The Old Town mine in Russell gulch will be reached either through the Newhouse drift or on the Saratoga vein.

T. S. O'Neil has bought the Allen mill on Chicago creek, near Idaho Springs, and is refitting it to handle custom ores by concentration, the mill being equipped with jigs, tables and stamps.

The Pacific M. Co., developing the Pacific and other lodes in Bridal Veil gulch, on Republican mountain, near Georgetown, says Manager Hartsborn, are in 345 feet on the Pacific lode, showing galena. They will put in a concentrating and power plant, to be run by water, and machine drills will be used.

The Key West M. Co. of Denver is developing the Key West and McKinney lodes on Leavenworth mountain, near Georgetown. There are two shafts on this vein, each 60 feet deep. Superintendent Murray is driving on the McKinney and crosscutting from this drift to the Key West.

The Monarch tunnel near Idaho Springs resumed driving last week.—It is reported the Big Chief M. & M. Co. will sink the main shaft another 200 feet and run levels, before taking out ore. The group consists of seventeen claims which adjoin the Lexington and Little Richard, up Soda creek.

The Yankee Con. M., M. & T. Co. of Denver has decided to lease some of their properties at Yankee.

CUSTER COUNTY.

A 300-ton mill will be built by the Terrible G. M. Co., operating the Terrible mine, near Iles, says Manager Brooks. The ore is lead carbonate.

EL PASO COUNTY.

The Oil Creek G. M. Co. has begun development of the group which it owns north of Cascade.

FREMONT COUNTY.

M. McNamara, of Coal Creek, says he has leased 360 acres of his land to the Standard Oil Co. on a 10% royalty, and drilling will begin.

C. Meyer and S. A. Van Buskirk, of Canon City, say they have opened up a ledge of black syenite, suitable for building and ornamental uses, near Cotopaxi. They have eighty acres of land covering the deposit. They will put up a plant in Canon City to polish the stone.

H. J. Hall and D. S. Hall have opened

up an ore shoot near the head of Smith gulch in Hardscrabble canyon, near Florence, which assays \$5 in gold, with some silver. They have located five claims on the vein.

A hoist will be built on the Gold Wonder mine, near Florence, and the shaft sunk to 300 feet.

The Fremont coal mine, near Rockvale, operated by the Colorado F. & I. Co., has been equipped with an electric lighting plant. Electric drills are used.

The Keystone Oil Co., near Florence, will drill another well.

GILPIN COUNTY.

The Cleveland M. Co. has bought portions of the Spur Daisy group of fourteen claims in the Eureka & Quartz Valley district for \$5000. The same parties are interested in the Bon Ton, adjoining the Spur Daisy, where they have installed machinery. J. Brohl is superintendent.

Central City parties are working the Ingoberg mine, on the north slope of Winnebago hill, and have the shaft down 310 feet. They are drifting from the 300-foot level and are making shipments to the Black Hawk mills.

The Deadwood placer claim, on South Boulder creek, near Rollinsville, was transferred by warranty deed by P. Rohling et al. to T. H. Potter and J. E. Lightbourn last week. This property is on the line of the Moffat road.

The shipments of smelting ores and concentrates from the mines around Central City for the first twelve days of January amounted to 131 cars, or 2620 tons. The ore was shipped to the smelters at Denver, Argo and Golden.

Manager Ballantyne, the Straub mine on Gunnell hill, near Central City, says their plant of machinery will be enlarged. The shaft is down 300 feet.

The Brooklyn group of mines (the Cashier, Republic Gregory and other patented claims), south of Central City, are being operated by the Brooklyn G. M. & M. Co., with R. St. J. Cleary of Denver as manager, and J. Faulkner superintendent of underground workings. The shaft is down 600 feet and crosscuts begun from the bottom of the same, both north and south. These crosscuts will open up five parallel veins, one of which is the extension of the Flisk-Cook vein and another is the extension of the O'Neill-Gregory lode. The Brooklyn Co. also own the stamp mill on North Clear creek.

The New National T. M. Co. will put in a 16 H. P. gasoline plant on the Horsehoe mine, east of Black Hawk. Chicago men are interested. The shaft is down 185 feet and will go deeper. J. Brohl is superintendent.

At the Barnes mine of the Horseshoe M. Co., on Quartz hill, the shaft is down 740 feet, says Superintendent N. H. Scheuer, and drifting has begun. The drift to the west is in 60 feet. They are working in the 600-foot stopes and running a crosscut to the north from the west 400-foot level. Lessees are stopping in the 400 level. Shipments have begun.

Idaho Springs parties have a lease and bond on the Golden Cloud group in Russell district, at the head of Virginia canyon, and will operate as the Golden Cloud M. Co. The shaft is down 300 feet and the lessees will sink 300 feet more.

The Central City Call says a local company is working the West Whiting mine on Gunnell hill under lease and making regular shipments from the 300 east level of fifteen to twenty cords per month of milling ore. S. Laner is in charge.

The Waltham mine near Russell Gulch will install a cyanide plant.

The Helen G. M. & T. Co., operating on the north side of Colorado hill, in the Pine district, near Central City, has a group of claims which will be developed by a tunnel, says Superintendent J. C. Coltrin, and machinery will be put in. The Moffat road will pass within a mile of the mine.

HINSDALE COUNTY.

Superintendent C. Forberg is driving the Double Standard tunnel near Lake City. — J. Cochrane, H. Barrett and J. R. Paterson have a bond and lease on the Lone Star group of claims on Henson creek, 1 mile from Lake City. The Lone Star is across Henson creek from the Pelican.

JEFFERSON COUNTY.

At Leyden, on the Moffat railroad, 10 miles northwest of Arvada, the Leyden Coal Co. are sinking a shaft to 660 feet, at which point it is expected to cut the vein. A spur is being built from the main line of the railroad to the mine.

LAKE COUNTY.

Minium (red lead) is reported in the Progressive M. Co. mine at Leadville. With it is associated silver chloride. The ore was found in the west drift of the Cady shaft.

The Crown Point, on Iron hill, Leadville, is being operated by J. D. Murphy

and M. Starne in the upper levels, where there is a body of iron ore. — The Virginious ground, running from Fryer hill across the gulch to the Progressive, is being worked by R. B. Estey. A shaft is started to cut the Progressive shoot. — The Resurrection mill started up last week and is treating 650 tons of ore daily.

The cyanide mill at the Ballard, on Brece hill, Leadville, is in operation, treating ore from the dump. At the Penn twenty-five tons a day are going out. — The Corona, in California gulch, is shipping thirty tons a day of lead ore, with silver values, which net the lessees \$30 a ton. The principal work is in drifting and stoping.

The Matchless mine, Fryer Hill, Leadville, has resumed under lease to D. D. Sullivan & Co. Work for the present is confined to the upper levels, where there is a body of iron ore. — The shaft of the Chrysolite resumed last week under lease to J. C. Hume & Co., and is shipping ore. — Hanifen & Reynolds have put a plant of machinery on the Ulster-Newton, and connections are being run to the Louisville. Milling ore is being taken out of the latter, and by spring the shaft will be unwatered and the sulphide bodies at the 1000-foot level worked.

Colorado Springs men have incorporated the Eleventh Hour M. & M. Co. The company has seven claims in Granite district on the Lake county side — the Eleventh Hour, Crater, Regina, Shady, Club, Last Chance and Coyote. The ore is part free milling and part smelting grade. R. L. Holland, A. K. Lanyon, J. Cromwell, W. R. Barnes and L. H. Skinner are the officers.

The Fortune mine, owned and operated by J. McNeese, has opened up a body of ore that averages \$40 per ton.

The Keystone M. Co., operating the Rex group, near Leadville, will put in a heavier pumping plant and unwater their lowest workings.

MESA COUNTY.

The Home and the Curtis oil companies of Debeque are drilling.

SAN JUAN COUNTY.

The shaft of the North Star mine on Sultan mountain, near Silverton, is being unwatered.

The Bluebell M. Co., owning the Hudson and American Belle mines at Red mountain, near Eureka, has resumed on the former and is drifting from the fourth level.

The Evening M. Co., owning the Evening Star mines in Mastodon gulch, near Silverton, has been reorganized. M. T. Jones of Chicago, Ill., is manager, says the Silverton Standard. — The Lackawanna mine on Kendall mountain, bonded by the Four Metals Co., is being opened up. — The North Star (Sultan mountain) shaft has been unwatered, using a 250-gallon balling tank.

SAN MIGUEL COUNTY.

Twenty stamps will be added to the Alta mill in Turkey basin, near Telluride, says Manager A. C. Koch.

The Copper Basin M. Co. is developing its group of eleven claims 2 miles from Placerville.

Superintendent J. H. Litchfield, the Double Eagle G. M. Co., has men on development work on the Double Eagle group of claims in Bridal Veil basin, near Telluride. The company expects to build a mill near Blue lake.

SUMMIT COUNTY.

Manager C. A. Finding has miners at work in the Iron Mask tunnel, near Breckenridge, retimbering, with the intention of running the tunnel another 700 feet to connect with the shaft. The tunnel is in 1300 feet.

Work has begun on the 800-foot tunnel of the Gold Bell M. Co. on the west slope of Mount Baldy, near Breckenridge. The principal ore body is a quartzite ledge, the continuation of the ledge on which the Golden Edge group and stamp mill are located. The tunnel will crosscut several lode claims owned by the company and be driven through the auriferous quartzite to the lime contact where carbonate ore carrying values in gold and silver is expected. A. Kemper is manager.

The Lightburn 7x7 tunnel of the Gold Run, near Breckenridge, is in 1420 feet and a branch from the main tunnel is being driven. The work is being done to develop fifty lode claims near the head of the gulch and will be driven for 3000 feet. Light and air are being supplied by electricity. — The Carbonate lode on Mount Baldy, operated by Risley, Moon & Horn, is shipping ten tons per month of a silver-lead ore that carries good values. The pay streak is 12 inches wide and in the trachyte. A tunnel will be driven to cut the vein from 200 to 300 feet deeper than the present workings.

The Mountain Pride mine on Mount Baldy, at the head of Illinois gulch, near Breckenridge, continues its regular out-

put of 100 tons per month of silver-lead ore and concentrates. — At the Cashier, in Brown's gulch section, the mill's capacity has been increased 200 tons per day of ore from the 80-foot ledge of gold and silver-bearing quartz.

TELLER COUNTY.

The Last Dollar and the Blue Bird mine on Bull hill, at Cripple Creek, have resumed.

Manager Walsh, the Addie Co. on Mineral hill, Cripple Creek, says he will sink to 1000 feet.

The Rocky Mountain L. Co., operating on the south end of the Deadwood claim, near Cripple Creek, made a shipment of thirty tons smelting grade ore last week.

The Des Moines Co. has granted a lease to J. T. Brown on its two claims, the Mud Hen and Bob Tail, on Raven hill, Cripple Creek.

Lessee Hammond has begun operations on the Colorado City claim of the Amazon M. Co., near the Sitting Bull, Cripple Creek district.

The Addie C. shaft on Mineral hill, Cripple Creek, will be sunk to the 1000-foot point, says Manager J. R. Walsh. A steam plant and a four-drill air compressor will be installed.

A plant of machinery will be installed at the Pueblo & Cripple Creek Railway tunnel, near Cripple Creek, in the breast of the tunnel, in 7700 feet. Pyrites are being found assaying \$8. A drift has been run 200 feet to connect with the shaft of the Callie, 400 feet deep. Stopping will be done from this level to the surface.

The Arequa mill, near Cripple Creek, has been bought by the Colorado Ore R. Co. for \$67,376. The property included the mill, the millsite, the townsite and all other rights.

It is reported the Victor mine will resume, with J. Canning of Aspen as manager.

J. F. Hadley has bought a half interest in the Henry Adney claim, near the C. K. & N. and Old Gold mines, Cripple Creek. The shaft will be sunk to the 400-foot level and laterals driven after the 200-foot station is cut.

Superintendent J. Barr has begun operations on the Pinto claim of the Free Colnago Co. on Bull hill, Cripple Creek, under lease to H. Shell of Altman.

The Cripple Creek Enterprise G. M. Co. has resumed sinking in the Hanley shaft at Cripple Creek.

Machine drills will be put in at the Lincoln mine, near Gillett.

Superintendent H. M. Risley is opening up the Frank Burk group on Iron mountain, 2½ miles southwest of Cripple Creek.

Lessees Rogers & Mullins, operating through the Burns shaft of the Acacia on Bull hill, Cripple Creek, shipped a car of two-ounce gold ore this week. Lessees McKinsey & Read, operating on the south end, will sink. There are seven sets of lessees on the Acacia.

The Stratton ground of 650 acres will be leased, says Manager W. G. Rice of the Stratton Cripple Creek M. & D. Co., in blocks 300 feet square. Blocks may contain a portion of one claim, and part of another, as the whole will be surveyed and platted regardless of claim lines.

The Iowa Co., working on the south slope of Trall mountain, 3 miles from Victor, has a shaft down for 75 feet and is using electric drills.

The Ophir mine, on Raven hill, Cripple Creek, is producing 180 tons of smelting grade ore each month. The work of driving the tunnel to connect with the shaft is going ahead.

The Eleanor & Dorothy G. M. Co., owning claims adjoining the Sedan and Sunshine claims, will let a contract for driving a crosscut west from the Dorothy & Eleanor shaft to cut the Sedan vein. It is believed a crosscut 25 feet in length will cut the vein. The shaft is down 150 feet.

Lessees on the Anaconda Co. ground on Gold hill, Cripple Creek, are producing 600 tons a month of \$30 ore. Thirty-five sets of lessees are working, of whom fifteen are shipping.

Three new leases were granted on the Pharmacist, at Cripple Creek, last week. Floyd & Carter have the ground from the sixth to the fourth level, Whitlock & Speers a block on No. 5 and Nesbitt & Co. on the Water Witch shaft.

The lessees operating the Blanche, on Bull hill, at Cripple Creek, last week closed a shipment of two carloads of smelting grade ore. — The production of the Tornado mine, on Raven hill, has been increased to a carload a day.

Operations are resumed on the Rose Maud by Lessees Nelson and Honning and a steam plant and hoist are being installed. The shaft is down 125 feet.

Three sets of lessees are working on the Mint property, on Gold hill, Cripple Creek district.

The shaft on the Addie C., on Mineral hill, Cripple Creek district, will be sunk to the 1000-foot point. The shaft is 458 feet deep, with two levels started to ex-

plore the formation at 300 feet and at 400 feet. The 300-foot level is being driven south of the shaft. A steam plant and compressor will be installed.

The Blue Flag Co., operating the Blue Flag claim on Raven hill, Cripple Creek, is retimbering the shaft. Machinery will be put in.

Morris, Johnson & Darnell have a two years' lease on the north end of the Ramona mine, on Bull hill, Cripple Creek, and will prospect to find if the extension of the War Eagle shoot passes into that ground. In trenching they have opened a vein on surface which yields free gold in panning.

Lessees Schoonover & Miles, working on the Little Valeria, on Gold hill, Cripple Creek, which adjoins the Gold Bond, sent out their initial shipment last week, which assayed \$20 gold. — Wilson & Co., operating a lease on the south end of Goldfield, have cut a vein at a depth of 60 feet which assays \$10 gold. — Lessee Reiten, operating on a block of the Bonanza King, on the northwest slope of Gold hill, has opened an ore chute 2 feet wide in a crosscut run for 40 feet north of the shaft at the 80-foot point.

IDAHO.

BLAINE COUNTY.

The Amalgamated Gold Dredging Co. of South Dakota has bought of J. E. Bloom and H. L. Childs their interests in the Nineteenth, Euclid, Euclid No. 2, Lupita and Century placer claims, near Soldier, aggregating 660 acres on the South Boise river, north of its junction with the Big Smoky river; also the Childs placer claim of 20 acres adjoining the above.

At the Tip Top mine, near Halley, Superintendent Lusk is drifting on the 1100-foot level.

T. C. Woodbridge and T. M. Smeltzer have located the Woodbridge, Woodbridge No. 2, Smeltzer, Smeltzer No. 2 and Chas. McGrade lode claims in Lava Creek mining district, near Halley.

BOISE COUNTY.

The tunnel on the Maud Marsh, on Miller mountain, near Idaho City, has been run 188 feet this winter. A crosscut was run from the 50 foot point and another at 100 feet. Both were run 45 feet in ore assaying \$6 a ton, says G. A. Williams.

H. Daly, working the Gentle Anna claim, one of the group near Idaho City bonded to V. Thorne, says a tunnel has been run 200 feet, and in ore except the first 40 feet. At 160 feet a crosscut was run 45 feet to the hanging wall, in ore that will run \$6 a ton. On the hanging wall a 3-foot shoot goes \$20. The depth at the face of the tunnel is 75 feet. A raise will be run to the upper works. A crosscut tunnel, run 200 feet, tapped a 7-foot ledge of \$15 ore in the Democrat. There has been opened a 5-foot ledge of ore at the depth of 100 feet in the John Henry. The Democrat is the north vein, with a dip of 60°; the Gentle Anna next, dipping at 30°; the John Henry the south vein, with a 45° dip. A shaft will be sunk 500 feet in the spring on the apex of the Anna, and at 500 feet will cut the Democrat. A 40-stamp mill will be put upon the properties next summer.

The Last Chance mine at Quartzburg closed down Jan. 12th because of too much water.

Woodmore & Youren have a contract to run a 200-foot tunnel on the Belshazzer mine, near Placerville, which is bonded to W. D. Southworth, of Placerville.

CUSTER COUNTY.

Manager W. McK. Flynn of the Snowstorm M. & M. Co. says they are developing their group of thirteen claims in the Seafarm mining district. The Snowstorm ledge runs 4982 feet through four of the claims, and carries values in lead, gold, silver and zinc.

IDAHO COUNTY.

B. J. Mack, secretary and manager the Rankin M. & M. Co., in Black Lake district, 16 miles from Pollock, reports construction work has begun on the mill and concentrator.

Manager F. Brown, the Jumbo mine of Buffalo Hump, says a concentrator, cyanide plant and twenty stamps will be added to the mill. The strike in the lower tunnel shows 12 feet of quartz, which assays \$10. The ore body in the upper tunnel is 9 feet wide and assays \$12 per ton.

D. Terwillinger, of Weiser, has bought the interests of his associates in the Snow Slide group of sixteen claims on Snow Slide creek, Thunder Mountain district. The claims are 8 miles from the Dewey mine, between it and Profile creek. A ledge 50 feet wide, running through the group that averages \$5 per ton has been uncovered.

W. D. Lovejoy, M. A. Daily, J. P. Gray and W. D. Manley will work the Short

Bar placers on the Little Salmon river, near Pollock, under lease and bond.

H. H. Hunter, operating on Big creek, in Thunder Mountain district, 35 miles from the Dewey mine, has 18 men at work.

The American Eagle, at Elk City, last week shipped two gold bars worth \$3300 as a result of a 10-day run, says C. K. Merriam of the company operating the mine under bond. There are seventeen claims in the American Eagle group.

KOOTENAI COUNTY.

The Panhandle Smelter Co. has bought 400 acres of ground at Sandpoint, where it will build a smelter next summer.

OWYHEE COUNTY.

Superintendent Prisk of the Sinker tunnel, near Silver City, says the tunnel company will not resume operations until they can get lumber for a power plant, which will be in April.

LOUISIANA.

CALCASIEU COUNTY.

The Virginia Oil Co. has incorporated to operate in the Welsh field in the Conover subdivision, on which S. H. Keoughan is putting down a well; G. Conover, J. F. Miller, W. B. Conover, F. E. Bliss, R. W. Mills, M. Yable, C. M. Tinney and J. F. Miller. W. B. Conover is manager.

MICHIGAN.

INGHAM COUNTY.

A Chilean mill is in operation at the Quincy stamp mill at Mason, regrinding the coarse gravel as it comes from the beads. The Osceola is putting in a similar mill.

HOUGHTON COUNTY.

The management of the Atlantic is operating thirty-three drills and sending to the mill 1375 tons of ore daily. A shaft is sinking to the eighth level. B shaft is down to the twentieth level and D shaft is sinking to the thirty-fourth level.

The water power of the Victoria, near Houghton, is to be developed on a larger scale than at first planned, in order to furnish power for the Michigan mine and mill as well.

It is reported that the output from the three principal mines of the South Range group this year is expected to reach 40,000,000 pounds of refined copper, and this from twelve shafts. The output of the Calumet & Hecla is on a basis of 80,000,000 pounds of copper per annum, operating through twenty shafts.

The stamp mill of the Phoenix is inclosed and will be in operation by March 1st. They will run the single head on day shifts only for 1903, as not enough stopes have been opened underground to supply the head with rock for double shift, says the News. Cutting down and retimbering shafts and opening the incline shaft at the St. Clair through to surface have precluded opening as many stopes as desired. The Phoenix is expected to return thirty pounds ingot copper per ton of rock stamped. A portion of the product will be mass and barrel copper.

MONTANA.

FLATHEAD COUNTY.

D. P. Bowers, manager the Snowshoe mine, near Libby, owned by the Rustler M. Co. of Spokane, Wash., says a strike of 2 feet of galena has been made, and the company will spend \$50,000 during the coming summer in enlarging the mill and putting in power.

Finch & Campbell, of Spokane, will resume operations on their group of claims at Silvanite next month.

GRANITE COUNTY.

The Gladstone M. Co., L. U. Loomis superintendent, operating on Gold creek, near Phillipsburg, has temporarily closed down.

A. C. Beggs, who bought the Hughes interests on Little Gold creek, near Phillipsburg, will build a reduction plant.

JEFFERSON COUNTY.

W. Dodge, B. Kilburn & Co., developing a group of claims in Basin creek district, 2 miles north of Basin, will install a hoisting plant.

PARK COUNTY.

J. A. Murray, of Butte, is working his mine at Jardine and will drive a tunnel 2500 feet to cut the ledges exposed on the surface.

SILVER BOW COUNTY.

(Special Correspondence).—At the annual meeting of the Montana Standard M. Co. P. T. Davis was elected president, L. Wotrich vice-president, F. T. Britton treasurer, W. H. Lindsay secretary; trustees—A. N. Yoder, B. Calkins, R. W. Charlton.

Butte, Jan. 15.

NEVADA.

ELKO COUNTY.

The Leonard Taylor M. Co. of Albany, N. Y., has bought the property of the Bull Run M. Co., at Bull Run, for \$150,000. M. E. Hopkins of Boise, Idaho, is manager.

At White Rock the Edgemont Co. is employing forty-five men and has its 20-stamp mill in operation. Thirty men are at work in the Curieux mine, and ten stamps dropping. The Riddle mine is reported bonded by Eastern men for \$100,000.

H. P. Taylor, manager and part owner the Murphy-Curieux mines at Bull Run, near Tonopah, says the 10-stamp mill will be enlarged to twenty stamps and cyanide works added. The cost of these and other necessary work will bring the total to \$200,000.

ESMERALDA COUNTY.

The Nevada Chief M. Co. has taken up its bond on the Rockland mine near Pinegrove.

The Southern Nevada G. M. Co. has bought several properties around Red Mountain and Silver Peak. Development work will be continued and a reduction plant built at Silver Peak.

HUMBOLDT COUNTY.

Returns from two carloads of ore shipped from the Arizona mine of the California-Nevada Co., at Unionville, are said to have been so satisfactory that a mill will be built.

The sulphur deposit near Humboldt House will be worked to ascertain its depth and value.

There are twenty-three men at work in the Glasgow & Western Co.'s Adelaide mine, at Golconda, and pay rock is piling up on the dumps.

LINCOLN COUNTY.

(Special Correspondence).—The Nevada-Keystone M. Co., whose mines, mill and cyanide plant are in the Yellow Pine mining district, near Sandy, has twelve claims, forty acres of land in their millsite, two Huntingtons, and a 30 ton cyanide plant. Before incorporating the owners spent \$35,000 developing new ore bodies, as the mines were supposed to have been worked out after producing over \$380,000. The company was incorporated in May, 1902, and has taken out \$10,000 every month. The deepest workings are 700 feet, the ore assaying \$154 gold per ton, and is free milling—85% saved by amalgamation. Ore bins are building at the mines. A road from the mine to the mill is being constructed, and excavating for a new hoist is in progress. On the 300 level a raise has been started to connect with the new incline. Samples in a drift on the 300 level from a streak 18 inches wide gave \$132 gold to the ton. An average of fifty-four tons of ore milled gave \$50 per ton. A small streak in drifting from the winze in the 200 level returned \$212. Another body of ore has been struck on the Barefoot claim.

Sandy, Jan. 24.

(Special Correspondence).—Searchlight district was formed four years ago. It is in the southern part of the county and is reached by way of Goff's, on the Santa Fe R. R. The district is 30 miles long by 15 miles wide. There are three groups of properties producing in the aggregate \$100,000 per month. The ore is gold and is free milling. The average values run about \$15 to the ton. Besides these properties owned by the Southern Nevada M. Co., the Duplex Co. and the Quartette M. Co., each owning their own mills, the Rambler group, owned by Maud & Coleman Co., and the mines of the Wilson M. Co. of Edinburgh, Scotland, are being worked. Other properties are being developed. The town of Searchlight has a population of 600 people.

Searchlight, Jan. 23.

G. E. Otis of Redlands, Cal., has bought three-quarters interest in the Commonwealth group of mines, near Searchlight.

C. Alvord is developing his claims at El Dorado. On the McKinley he has a 40-foot shaft, and the ore is being shipped by wagon 50 miles to Manvel, Cal., thence by rail to San Francisco. On the Skylark are two tunnels, 145 feet long, cutting the ledge at 200 feet depth, showing a 14-inch shoot of \$25 ore.

At a depth of 77 feet the shaft of the Cyrus Noble near Searchlight is in ore which runs \$10 in gold, says Superintendent W. H. Bainbridge.

Turquoise is reported found in the country rock at Bamberger's De Lamar mines. The Toltec M. Co. turquoise mines are in the same district.

LYON COUNTY.

Manager F. Leonard, at Sutro, says operations have begun on the tunnel to unwater the south end of the Comstock by the Gold Canyon Extension Co. This tunnel will begin at the end of the Sutro at

the Alta shaft and extend to the Dayton shaft, 8300 feet. It will run on the vein and open up the mine at an average depth of 1000 feet. The greatest depth now worked is 250 feet. The success of this extension will lead to the extension of a lateral 5000 feet to American Flat. A short distance beyond the Alta shaft the Comstock lode divides, one branch going to Silver City and the other to American Flat. The Gold Canyon will install a mill and acquires the right to work the mines if the owners do not do so themselves. The Con. Cal. & Virginia is pumping from the 2150-foot level, and it is proposed with electric pumps to drain the 2500-foot level. This is 750 feet below the tunnel, and with the surface water provided for, it will be possible to go to that depth in the mines of Silver City below the tunnel level.

NYE COUNTY.

At the Montana-Tonopah mine, on Odie mountain, near Butler, the vein struck at 450 feet depth is being opened up. At 462 feet the ledge is 6 feet wide and dips south at an angle of 67°, says the Miner. On the hanging wall is a shoot of sulphide ore 15 inches wide carrying ruby and horn silver and gold. Superintendent G. F. Badgett has twenty men at work.

The North Star, near Butler, is putting up a hoist to sink the shaft, now down 540 feet, to 1500 feet, says Manager Ish.

The Mizpah Extension Co. has their main shaft down 625 feet and more. The crosscut at the 485-foot level is in 105 feet and in the ledge cut above the 400 in the shaft.

A 13-foot ledge has been cut in the shaft of the Desert Queen, near Butler, carrying values of \$15 per ton. At 609 feet a station is being cut.

In Hananah district L. L. Patrick has begun work with ten men on the Pinto group of fifteen claims adjoining the Newhouse property. Four veins have been located on the Pinto group and surrounding croppings show values in gold and silver.

At the Templar group of three claims and a fraction near Butler, adjoining the California-Tonopah on the west, Superintendent L. L. Patrick has let a contract to sink 200 feet.

In the Fraction, near Butler, connection was made last week on the 400 level between shafts Nos. 1 and 2, and men are at work in No. 1. In this crosscut the last 132 feet were run in twenty-one days.

A strike of ore, running high in gold, silver and lead, was made in the 165-foot level of the Ray & O'Brien last week in Tonopah.

STOREY COUNTY.

Drill hole No. 3 on the Brunswick lode, near Virginia City, is down 550 feet. The bottom is in porphyry and requires no casing.

WASHOE COUNTY.

A discovery of coal is reported near Verdi.

At the Wedekind and Blackburn mine, in Antelope valley, the engine for the mine is in place and the mill in operation. The Lee Bros. have bonded their three claims for \$80,000, and received \$4000 as first payment.

WHITE PINE COUNTY.

The hoist on the Copper Flat mine at Ely is in operation.

NEW MEXICO.

BERNALILLO COUNTY.

W. D. Kemp has sold a half interest in the Manhattan copper mine, in the Sandia mountains, 14 miles east of Bernalillo, to F. E. Sturges of Albuquerque.

CHAVES COUNTY.

W. A. McIvers, manager New Mexico Oil & Dev. Co., operating near Roswell, says their first well is down 300 feet, and, from the appearance of the formations, they expect to get oil at from 900 to 1200 feet.

COLFAX COUNTY.

Croasdale & Love, contractors, are building derricks for the drilling plant of the New Mexico Oil & Gas Co. on McKom tract, near Raton.

GRANT COUNTY.

The property of the Lena M. & C. Co., near Lordsburg, was sold at trustee's sale last week to the American Con. C. Co., a New Mexico corporation with offices at Columbus, Ohio. The mill has a capacity of 150 tons per day.

GUADALUPE COUNTY.

The New Mexican says that a plant for neutralizing the alkali in water has been erected by the Rock Island railway at Santa Rosa, consisting of one large tank and four smaller ones. Water is pumped into first tank and solutions of lime and soda added, precipitating alkali. The water is then run into the four settling tanks.

LINCOLN COUNTY.

O. H. Stanley, vice-president and manager the American Con. M. Co., operating in the Rio Hondo district, near Hondo, says a reduction plant of 100 tons daily capacity will be built. The Fraser Mountain Co., south of the American, have in operation a smelter and concentrating plant of 120 tons daily capacity, but will double the capacity and install a larger electric power plant.

OTERO COUNTY.

Edmiston Bros. of Alamogordo have a drilling outfit of 1000 feet capacity, and will sink the first well for oil 15 miles southwest of Alamogordo and north of Dog canyon. They will also drill in San Andreas region.

SANTA FE COUNTY.

A new placer mining district is being opened up near Golden, in the southern part of the county, and fifty men are at work with dry washers, blanket tossing, etc. As high as \$20 per day has been cleaned up by one man.

NEW YORK.

CORTLAND COUNTY.

At Marathon, a gold-bearing vein is reported and assays are being made.

OREGON.

BAKER COUNTY.

Superintendent Barrett says the crosscut being driven on the Grand Union, near Sumpter, is expected to tap the Concord vein next week, giving a depth of 600 feet. The tunnel is in 690 feet. A mill will be built next summer.

Manager Bellman says the California aerial tram is in operation, near Sumpter, making the third aerial tram operating in the district. It has 5760 feet of steel cable, 1/4-inch diameter, making a traction distance of 2800 feet. The buckets carry 250 pounds each, and will deliver ten tons per hour.

Superintendent G. J. Barrett says operations will be resumed on the Big Four group near Sumpter, and drifting and crosscutting begun.

The Old Arrastra G. M. Co., C. S. Miller of Sumpter superintendent, will put ventilating machinery in their tunnel being driven on the Weigman claim. A 20-stamp mill and concentrating plant will be built next summer.

The Cracker-Klondike G. M. & D. Co. is incorporated, T. J. Marcum, S. O. Coolidge, A. O. Kessel, M. W. Beck with, C. H. Chance, to engage in general mining business, with headquarters at Bourne.

Four veins have been cut by the crosscut tunnel being driven with power drills to tap the ore bodies on the Oregon Monarch ledges near the Red Boy, near Sumpter.

At the Ross Gulch mine, near Geiser, the shaft is down 200 feet and a crosscut started. Hauling ore to the Empire mill is resumed.

GRANT COUNTY.

Manager W. H. Chambers, at the Big Producer group, near Alamo, expects to cut the Boston Boy ledge this week. There are eleven claims in the group.

Manager J. P. McGuigan says the lower tunnel of the Alamo Con. M. & M. Co., near Alamo, has cut the vein at 1200 feet and a vertical depth of 510 feet. Assays show \$10 gold. The company have two water rights, millsite, and placer ground for dumping and building purposes, and will build a mill this spring.

The Daines G. M. & M. Co. has bought the Golden Gate group of quartz claims in Quartz gulch, Alamo, for \$15,000.

JACKSON COUNTY.

J. O. Jillson will resume operations at the Jillson & Roberts mine next week. It is reported the La Flesh mine has been bonded to Portland parties.

The Bowden M. Co. is reported to have bought the Humason mill and water right, near Gold Hill.

The quartz mines south of Myrtle creek, near Jacksonville, are shipping ore. A 13-ton lot from the Little Chieftain mine returned \$700 net. The Continental, adjoining, was sold last week by G. W. Crews to W. B. Stewart for \$20,000.

Superintendent A. T. Lungren of the Cook & Green copper mine, in the Siskiyou mountains, near the State line, owned by Cooper, Hamilton & Co., says the ore shows 5% copper and \$6 gold per ton.

MALHEUR COUNTY.

The 20-stamp mill on the Black Eagle mine, near Malheur City, is in operation, says Manager Meikle.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Cleopatra Co., on Squaw creek, near Deadwood, is in 180 feet in the drift

from the bottom of the shaft along the quartzite, and is expected to cut the ore body at 200 feet.

D. N. Helzer, secretary and treasurer of the Spearfish G. M. & R. Co., operating at Cyanide, gives the following statement of the mill operations for December: Total net tonnage, 5065.59; average value per ton, tank filling, \$5.105; average value per ton, tank tailings, \$1.351; net indicated extraction, per ton, \$3.854; total indicated extraction, \$19,123.84. As the last bar of bullion ran \$7000, the total recovery for December was \$22,000, of which possibly \$350 was from old slugs, leaving \$21,500 as the actual recovery, \$2521 above the indicated recovery. The value in the tailings has been reduced by 50 cents, showing a recovery of 83%. The values obtained from fourteen fillings of the tanks show an average of the ore produced of \$5.97 per ton.

Work is resumed by the Titanic Co. near Carbonate, 10 miles northwest of Deadwood, and an air compressor and pump will be put in. The company owns 1000 acres of land and will prospect the quartzite. The shaft is 250 feet deep.

PENNINGTON COUNTY.

A strike is reported made in the Maloney Blue Lead copper mine, 5 miles from Hill City, of ore showing native copper and sulphides, with values in gold and nickel. The main ledge is 100 feet wide, opened by a tunnel at a depth of 700 feet. Drifts have been run both ways on the vein from the main tunnel, the strike having been made in the north drift.

TEXAS.

HARDIN COUNTY.

Contractor Davie has struck oil in the Davey well, at Sourlake, at 500 feet.

UTAH.

BEAVER COUNTY.

Each group of the properties of the Majestic M. Co. at Lewisville, below Milford, is to be electrically equipped, says Manager W. A. Parish. The ore opened up in the Old Hickory shows an average of 8.8% copper with gold and silver and the "waste dump" 2.9% copper with the screenings averaging 3.75%. A sampling of the iron ore body shows an average of 2.7% copper. The Marloweaux interest in the Gomer and Contact mines has been sold to the Majestic Co.

The plans for the concentrator to be built on the Cactus group, near Frisco, have been changed, and a plant of 1200 tons will be built instead of less. G. K. Fischer is superintendent.

J. Henshaw, secretary of the Majestic M. Co. at Milford, gives details of a strike in Oklahoma ground in the Old Hickory group. The development in the Oklahoma consists of a vein 15 feet wide of copper, gold and silver-bearing ore which assays an average of \$25.

The Montreal group of mines out of Milford are sold to A. B. Lewis of Salt Lake City for \$200,000.

The Imperial M. Co. are putting up a gasoline hoist, bunk houses, blacksmith shop, etc., at the Comet mine, near Frisco.

Manager Ehrenberg of the Frisco mine at Frisco, says the output of the mine for January would be 2000 tons of concentrates. The company has 250 men at work and 550 tons of ore per day are being taken out. The greatest depth in the mine is 2000 feet from the apex of the vein. The shaft will be sunk another 200 feet.

Shipments of iron ore from the Cave mine, near Milford, will be increased to a carload a day.

The Horn Silver mill at Frisco will resume.

DAVIS COUNTY.

Articles of incorporation were filed last week by the Texas M. Co., which will operate the Texas, Olympia, Iowa, Oregon, Alabama, Indiana and Galena Dip Nos. 1 and 2 claims, near Bountiful.

JUAB COUNTY.

A body of 30% copper ore was uncovered on the 300-foot level of the Star Con. at Tintic last week.

The Monster M. Co., of Dutch mountain, in Deep Creek region, near Fish Springs, adjoining the Garrison M. Co., has bought the Uncle Sam claim for \$8000. This ground is valuable to the company, as it affords access to a tunnel site, through which their ore bodies can be opened up and which ore wagons can reach with little expense. J. A. Edwards, developing a property 2 miles east of the Gold Hill, on the edge of the desert, says he is sinking on a 4-foot ledge that carries \$7 in gold and a percentage of blisuth.—The Christmas Co. has let a contract to sink its shaft another 100 feet, it being down 90 feet.

The Centennial Eureka of Tintic will sink the shaft to 500 feet below the collar,

giving a maximum of 2850 feet below the mineral-bearing zone.

The shipping of argentiferous iron ores from the mines of the Swansea M. Co. at Silver City to the furnaces of the Bingham Co. is suspended temporarily, says Manager Geddes.

S. F. Kershaw has taken a contract for driving the tunnel on the Elgin M. Co. group, near Diamond, another 200 feet. Work is being done through the Old Susan tunnel, now in 800 feet.

SALT LAKE COUNTY.

At the Old Evergreen in Big Cottonwood district, Manager H. J. McMillan says that at 550 feet the fissure on which they have been driving has opened up to 2 feet, and carries copper pyrite associated with red oxide, and carbonates showing 4% copper, \$4 gold and eight ounces silver.

From the Highland Boy's furnaces at Bingham, for the week ending Jan. 17 was forwarded to the Eastern refinery 302,000 pounds of copper, gold and silver-bearing bullion, with the plant running on 500 tons of ore daily, and from the United States S. Co. went 181,362 pounds of pig copper, carrying gold and silver, with three of its five furnaces in commission.

Connection was made last week through the Miners' Dream tunnel with the Brooklyn mine of the Bingham Con. In making the connection a body of ore 31 feet wide was opened up, running 40% lead and showing values in gold and silver. The Bingham management are taking ore from the Brooklyn and this week expect to strike the body of ore in the Antelope claim.

The Kennebec M. Co. of Salt Lake City, W. J. Craig manager, will install an electric power plant in Big Cottonwood canyon, and machine drills will be put in their mines near Alta.

The York M. Co., operating at Bingham, lost its hoisting plant by fire last week and much of the machinery was damaged. W. C. Orem is manager.

SEVIER COUNTY.

The Gold Cup M. Co. has incorporated at Richfield, B. T. Ashby, A. K. Hansen, J. E. Hepler, H. N. Hayes, A. M. Hepler, to operate a group of ten claims adjoining the B. W. & H. on the north. Development work will begin next month.

Manager H. J. Gottfredson, the Gold Mountain D. Co. in Deer Creek canyon, near Richfield, says the tunnel being driven to cut the Jumbo vein is in 200 feet, and in another 100 feet it is expected to cut the lode at a depth of 250 feet. The ore carries gold and silver, being a cyanide proposition, and a plant will be installed as soon as sufficient ore has been blocked out.

SUMMIT COUNTY.

S. Spiro, manager the Little Bell of Park City, reports the shaft down 500 feet and crosscutting begun at that level.

The Nalldriver hoist, near Park City, is completed and the gallows-frame is being built.

Superintendent J. H. Keetley of the King Extension, near Park City, says they will consolidate with the Bogan M. Co. and resume development of both properties.

TOOELE COUNTY.

A mill is to be built at the Stockton mine of the Stockton G. M. Co., near Stockton, says Manager J. J. Trenman.

The Garrison G. M. & M. Co. has bought the Uncle Sam mine on Dutch mountain, Clifton district, near Ibapah, for \$6000.

WASHINGTON COUNTY.

Manager G. Snyder, the Dixie mines, near St. George, says the smelter will be completed next week.

WASHINGTON.

FERRY COUNTY.

At the Black Tail mine, near Republic, a drift is being run on an ore shoot on the intermediate level, and shipments made.

The Zala M. mine in Republic has suspended operations because the Granby smelter cannot treat its ores, due to lack of coke.

OKANOGAN COUNTY.

M. A. Smalley & Sons have put up a horse whim on the Oregon mine, near Chesaw, and resumed sinking the shaft.

STEVENS COUNTY.

Superintendent J. R. Lee of the Eagle mine at Chewelah says the ledge has been opened up, showing 21 feet in width on the lower level and carrying silver, lead and peacock copper.

The Minoreca mine on Fifteen Mile creek, near Ryan, under Superintendent L. L. Tower, will put in a diamond drill to prospect their ore body. He has 500 tons of ore on the dump, which will be shipped.

Only three of the six furnaces of the Le Roi Co. smelters at Northport are in operation because of shortage in coke supply.

WYOMING.

CARBON COUNTY.

The Osceola and Copper Belt properties near Dillon are bonded for sixty days. The Osceola has been bonded to W. G. Emerson and the Copper Belt to C. Fishback—each for \$200,000. The Copper Belt Co. is driving a tunnel on a vein found by J. Morrison and is intended to develop all of the company's properties. A crosscut will be driven 500 feet north to cut the main Rudelheh lead.

The North American Copper Co., having drained the Ferris-Haggerty group near Dillon by tapping with a tunnel, will sink 500 feet deeper, says Manager W. Bunce.

FREMONT COUNTY.

A new copper and gold camp is being opened up at Papville at the head of Bridger creek, 21 miles from Lost Cabin and 21 miles from Thermopolls Hot Springs. There are thirty-five claims in operation. The Copper Glance and the Lone Tree are being developed by J. E. Dain of Caspar, Wyo.

FOREIGN.

BRITISH COLUMBIA.

Superintendent P. White of the Wilson mine, near Ymir, says a partial clean-up from a test run of the mill gave a gold bar weighing eight pounds. They are saving 75% of the values by amalgamation, and the tailings from the concentrates assay \$1.50 per ton from ore that runs \$12. The ore running \$40 is shipped.

On the Dumas group, near Ymir, the lower tunnel is in 250 feet and in ore. Another 50 feet will bring the face to a point 100 feet below the pay streak of galena ore exposed at the mouth of No. 1 tunnel.

J. E. Edwards, owning three-sixteenths interest in the Blue Jay mine, in Skylark camp, has a bond and lease on the remainder for \$10,000. The Blue Jay is 1½ mile from the city, on the same ledge with the Old Ironsides and Knob Hill mines.

The Montreal & Boston C. Co. will put in a copper converter at its smelter at Boundary Falls.

J. Nelson, F. Williams and E. Johnson will work the Rob Roy group of mines, consisting of the Rob Roy and Copper Belt Fraction, in Isadore canyon, near Fort Steele. The quartz carries copper and gold.

The Caribon Creek D. Syndicate has bought a one-third interest in the Fidelity group of six claims—the Abercombe group—adjoining the Mountain Lion south property on American hill, near Ferguson.

CANADA.

QUEBEC.

C. K. Milbourne, of Montreal, says a copper producing plant will be installed at Shawingan Falls, 90 miles from Montreal, if the co-operation of firms interested in the copper trade cannot be secured to have the plant built at Montreal.

MEXICO.

CHIHUAHUA.

The shaft of the Shamrock mine of the Boston & Chihuahua M. Co., at Terrazas camp, last week cut a body of ore, says Manager Ariett, assaying in lead and silver equal to \$20 in gold values. The shaft is being continued and a drift run from the 200-foot level.

The next annual meeting of the International Miners' Association will be held at Chihuahua.

Manager W. J. Parker of the Urique G. M. Co. is having machinery for its 100-ton mill at Urique packed in from Minaca. The machinery was made in sections for this purpose. It is expected to be in operation by June.

It is reported the Eureka M. Co. struck a body of ore in the Santa Juliana mine, in the Santa Eulalia district, last week, that runs fifty ounces silver and 25% lead. The strike was made with the diamond drill from a drift on the 125-foot level.

SONORA.

Six miles northeast of La Dura, on the Yaqui river, J. McCallum and J. L. Shepard will begin development of their copper mine, the Creston de Cobre.

C. Anderson has bonded the Beaverich copper mine, near the Yaqui, north of Sahuaripa, and will begin development.

The Yaqui S. & R. Co. will build a smelter at their mines near Ures.

Phelps, Dodge & Co. are reported to have a lease and bond on the mines of the Indiana-Sonora Copper Co., on the Cobre Grande lode in the Cananea district, for \$1,000,000.

W. E. Defty has bought a one-fourth interest in the Yaqui mine, adjoining the Martha, near Altar.

Manager J. C. Underwood of the Yerkes M. & M. Co., at Camp Yerkes, near Altar, says construction work has begun on their mill.

PERSONAL.

R. J. WALTERS of Denver, Colo., is in Kingman, Ariz.

T. L. ODDIE of Tonopah, Nev., is in San Francisco, Cal.

T. B. SCOTT has returned to Chicago from Chloride, Ariz.

F. ISH is manager of the North Star M. Co., Butler, Nev.

E. R. WOAKES, Nelson, B. C., has gone to London, Eng.

M. P. BOSS has returned to San Francisco, Cal., from Mayer, Ariz.

MANAGER FELT of the Model M. Co., near Prescott, Ariz., has gone East.

LEON M. HALL has returned to San Francisco, Cal., from Tonopah, Nev.

W. T. SPENCER, owner of copper mines at Rainville, Utah, is in San Francisco.

D. M. WATTERS is superintendent of the Cracker-Oregon mines at Bourne, Or.

H. K. WHEELER, a Los Angeles mining engineer, is sojourning in San Francisco, Cal.

J. J. DALY of the Daly-Judge mine at Park City, Utah, has returned from the East.

C. R. TOWNSEND is superintendent of the Virginia mine in Greenhorn district, Oregon.

W. C. GREENE, president Greene Con. Copper Co., Cananea, Sonora, Mexico, is in New York.

W. L. WATTS has returned to Los Angeles, Cal., from Santa Barbara county, Cal., oil fields.

E. W. GIDDINGS of Colorado Springs, Colo., is president Isabella G. M. Co., at Cripple Creek, Colo.

MANAGER J. K. ROMIG of the Sanger mine near Baker City, Or., has returned from Milwaukee, Wis.

G. H. ROBINSON, manager of the Tintic M. & D. Co. of Tintic, Utah, went to Butte, Mont., last week.

B. BLANCHARD, superintendent of the Iron King mine, near Jerome, Ariz., has returned from the East.

F. H. OLIVER of Spokane, Wash., managing director Morrison mines, near Rossland, is in Rossland, B. C.

G. K. FISCHER is superintendent of construction at the concentrator of the Cactus mines at Frisco, Utah.

D. C. MONROE is superintendent of the Rowe mine of the New York & Arizona G. M. Co. at Walker, Ariz.

MANAGER M. J. TRUE of the Bluebird M. Co., near Dillon, Beaver county, Utah, has returned from the East.

T. M. YERKES, president Yerkes M. & M. Co., at Camp Yerkes, near Altar, Sonora, Mexico, is at the mine.

W. L. HOLMES, manager of the Altadena-John Royal mines, near Columbia, Cal., is in San Francisco, Cal.

MANAGER G. MOORE of the Sunshine M. Co. returned last week to Salt Lake City, Utah, from Kansas City, Mo.

L. L. MYERS, superintendent of the Malakoff mine at North Bloomfield, Cal., is in San Francisco, Cal., this week.

SUPERINTENDENT J. A. PORTER, Fair view mine, near Weaverville, Trinity county, Cal., is in San Francisco, Cal.

H. W. HOYT, vice-president The Ailes-Chalmers Co., Chicago, made a business trip to San Francisco, Cal., this week.

MANAGER L. T. WRIGHT of the Mountain Copper Co. returned last week to Keswick, Cal., from San Francisco, Cal.

R. E. OBER, superintendent of the Beatrice mine at Murphys, Calaveras county, Cal., has gone East on company business.

W. E. SHEPMAN, president Maple Creek M. Co., has returned to San Francisco, Cal., from their mines near Weaverville, Cal.

H. W. TURNER, superintendent Cherry Hill mine, Siskiyou county, Cal., has returned to the mine from San Francisco, Cal.

J. F. STULTZ of Hermosillo, Mexico, is at Campo Santo Nifo, Sonora, engaged on construction plans for the Yaqui Copper Co.

W. E. THORNE has left San Francisco, Cal., for Forty-Mile creek, Alaska, to assume the management of the Big Bend M. Co.'s property there.

R. K. NEAL, manager of Finch & Campbell's mines, returned to Kendall, Mont.,

last week from an extended trip through Washington and California.

A. MOORE, manager Newton Cement Works, is also superintendent Colorado Portland Cement Works, near Florence, Colo., vice T. B. Rennell, resigned.

T. B. RENNELL has resigned as superintendent of the mill of the Colorado Portland Cement Works, near Florence, Colo., and will go to Philadelphia, Pa.

T. MCGUIGAN is manager American Boy Mines in Slocan district, B. C., and the affairs of the mine will be conducted from Sandon, B. C., instead of Spokane, Wash.

HOMER WILSON AND F. R. CULBERTSON have returned to San Francisco, Cal., from the Chloride-Bailey mine, Trinity county, Cal., in which they are interested.

R. NICHOLS, general manager Great Boulder Perseverance mines and mills in West Australia, is at Bingham, Utah, examining the ore bodies of the Boston Con. Co.

MANAGER A. TRITTENBACH of the Dutch M. & M. Co. at Quartz, Tuolumne county, Cal., has returned from the annual meeting of the company in San Francisco, Cal.

W. G. SCOTT, part owner and superintendent Scott-Dow M. Co. (Black Oak mine), at Soulsville, Cal., is in Oakland, Cal. W. P. Scott, manager same company, is ill with pneumonia.

A. J. MCMILLAN is managing director of the Le Roi Co., whose mines are at Roseland, B. C., and smelters at Northport, Wash., and will make his permanent headquarters at Roseland.

P. BOUERY, superintendent of the La Grange Hydraulic M. Co., Weaverville, Trinity county, Cal., is in San Francisco, Cal., and will visit the southern part of the State before returning to the mine.

Commercial Paragraphs.

CHAS C. MOORE & CO., of San Francisco, have leased larger and better equipped offices and salesrooms in the Union Foundry Block, San Francisco, and about March 1st they will occupy their new quarters on N. E. cor. Mission and First streets.

IN addition to the Truax ore cars, the Glohe Iron Works of Stockton, Cal., make a specialty of power transmission appliances, boxes, hangers, couplings, shaftings, pulleys, floor stands. Complete catalogue and price list will be sent anywhere on request.

F. W. BRAUN & CO., of Los Angeles, Cal., who have recently purchased the business of John Taylor & Co., of San Francisco, Cal., the old established dealers in assayers' supplies, have moved their San Francisco branch to the new large building, Nos. 18 and 20 Spear St., San Francisco, Cal., one block from the ferry depot.

THE C. O. Bartlett & Snow Co. of Cleveland, Ohio, write that they have lately received orders for their grill four-compartment driers from the Bronson Portland Cement Co., Bronson, Mich.; Illinois Central Railroad Co., Chicago, Ill.; Colonial Construction Co., Hudson, N. Y.; and they are also erecting driers for the St. Louis Portland Cement Co., St. Louis, Mo.; Egyptian Portland Cement Co., Detroit, Mich., and have completed two driers for the Southwestern Portland Cement Co., White Cliffs, Ark.

Obituary.

A. E. NELSON, formerly head of the Nelson Business College of Memphis, Tenn., died at Somerville on the 16th inst. of consumption. Three years past he was superintendent of the Maravilla Copper Co.

D. N. STRADLEY, M. D., manager of the company building a smelter at Banner in San Diego county, Cal., died at San Diego on the 15th inst. from injuries, the result of being thrown from his carriage. Deceased was 53 years old, and leaves a wife and one son.

Catalogues Received.

Catalogue No. 14, second edition, issued by the Allis-Chalmers Co., Chicago, Ill., is a good treatise on chlorination, cyanide and lixiviation, and will be sent upon request to any address.

New Patents.

DEWEY, STRONG & CO'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JANUARY 20, 1903.

718,809.—SPEAKING TUBE MOUTHPIECE—J. C. Bahr, S. F.
718,847.—LIFTING JACK—H. Dearhorn, Pescadero, Cal.
718,833.—BEET PLOW—W. H. Gilbert, Orange, Cal.
718,755.—FURNACE AIR HEATER—J. L. Giroux, Jerome, Ariz.
718,756.—STEAM GENERATOR—J. L. Giroux, Jerome, Ariz.
718,985.—WATER TOWER—H. H. Gorter, S. F.
718,781.—VENT FOR CASKS—J. G. F. Heiber, Spokane, Wash.
718,710.—BUCKLE—W. Houghton, Snohomish, Wash.
718,841.—BICYCLE HANDLE BAR—J. W. Leavitt, S. F.
718,853.—GOPHER TRAP—J. M. Merritt, Los Angeles, Cal.
718,819.—STAPLE—W. H. Morehouse, Wasco, Or.
718,559.—OIL BURNER—D. H. Mosteller, S. F.
718,728.—SMELTING FURNACE—Pettengill & Nicholson, Los Angeles, Cal.
718,739.—IRRIGATOR—E. E. Stende, Newcastle, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

AIR HEATERS FOR SMELTING FURNACES.—No. 718,755. Jan. 20, 1903. J. L. Giroux, Jerome, A. T. This invention consists of a series of vertically disposed pipes arranged to inclose the upper portion of the furnace through which the hot products of combustion pass, and from which pipes the air is led to the tuyeres, through which it is delivered into the lower part of the furnace proper. In conjunction with these vertical pipes a series of pipes extending transversely across the furnace above the vertical pipes is shown, into which transverse pipes the air is first transmitted and delivered from these pipes to pass through the vertical pipes and thence through the tuyere pipe or trunk, from which it is passed to the tuyeres. The invention is especially designed for use in connection with smelting and like furnaces.

STEAM GENERATING FURNACE.—No. 718,758. Jan. 20, 1903. J. L. Giroux, Jerome, A. T. This invention relates to a combination furnace and steam generator in which a crucible occupies the lower part of the furnace, and above this, in conjunction with suitably constructed water jackets, are arranged a series of vertically disposed water tubes surrounding and inclosed by sheets of steel, said tubes having their lower ends connected with a feed and supply pipe and the upper ends connected with a steam drum, into which the steam is collected. The rectangular water jackets are connected by upwardly extending corner jackets with the storage tank, into which the water is delivered and from which it is returned through suitable connections and delivered into the feed pipe which supplies the vertical tubes. This apparatus as constructed insures a more direct and better circulation of water through the pipes and steam drum than has apparatus of this class heretofore constructed.

MOUTHPIECE FOR SPEAKING TUBES.—No. 718,809. Jan. 20, 1903. J. C. Bahr, San Francisco, Cal. This invention relates to a mouthpiece for speaking tubes, and especially for such tubes as are used upon war and other ships or in other positions where they are exposed to the weather, and also where a large number of tubes are concentrated at one point. The object of the invention is to provide a protection and closure for the mouths of such tubes when not in use, an indicator, which is opened by the blast upon the whistle when one of the tubes is in use, and a means for opening the tube, so as to leave it entirely unimpeded for speaking purposes.

Latest Market Reports.

SAN FRANCISCO, Jan. 30, 1903.

METALS.

SILVER.—Per oz., Troy: London, 21 3/4 (standard ounce, 925 fine); New York, bar silver, 47 1/2c, refined (1000 fine); San Francisco, 47 1/2c; Mexican dollars, 38 1/2 @ 39c San Francisco, 37 1/2c New York.

COPPER.—New York: Standard, 11 1/2 1/4; Lake, 1 to 3 casks, 12 1/2 1/4; carload lots, 12 1/2 1/4; Electrolytic, 1 to 3 casks, 12 1/2 1/4; carload lots, 12 1/2 1/4; Casting, 1 to 3 casks, 12 1/2 1/4; carload lots, 11 1/2 1/4. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: \$54 12s 6d spot per ton.

Copper still shows an upward tendency. The Amalgamated Copper Co. and the United Metals Selling Co. are reported to have withdrawn from the Copper Producers' Association, but definite action has been postponed until February 17. Owing to the fact that some large producers have failed to make their monthly reports of production, and the suspicion that some companies have misstated their production, the obtaining of reliable figures is difficult, and as the stocks on hand bear an important relation to demand, and consequently price, a forecast of the market is only problematical.

LEAD.—New York, \$4.12 1/2; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4 1/2c 1000 to 4000 lbs.; pipe 5 1/2, sheet 6, bar 5 1/2; pig, \$4.75. London: £11 8s 9d per long ton = 2.49c per lb.

SPELTER.—New York, \$4.90; St.

Louis, \$4.50; London, £20 5s per ton; San Francisco, ton lots, 6 1/2c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9 1/2c; Hallett's, 8 1/2c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$29.10 @ 29.40; San Francisco, ton lots, 31c; 500 lbs., 31c; 200 lbs., 31 1/2c; less, 31c; bar tin, 3 1/2, 35c @ 37 1/2c. London, £132 10s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19c; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.50; large lots; London, £8 15s; San Francisco, local, \$45.50 @ 46.50; 7 1/2 lb.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 1/2c; extras, 17 1/2c; genuine, 35c; Eclipse, 37 1/2c.

ALUMINUM.—New York, No. 1, 99 1/2 pure ingots, 35c; No. 2, 90 1/2, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 19 1/2c; San Francisco, Plumbers', 100-lb. lots, 16 1/2c.

NICKEL.—New York, 50 @ 60c @ 70c; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3c @ 4c, 3 1/2c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00 @ 31.00; open hearth billets, \$32.00 @ 33.00; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	25.00 @ 25.50
Foundry Northern 1	23.50 @ 24.00
Northern 2	23.00 @ 23.50
Northern 3	22.50 @ 23.00
Southern 1	23.35 @ 24.85
Southern 2	22.85 @ 24.35
Southern 3	22.35 @ 23.85
Forge	21.85 @ 23.35
Barcoal	26.00 @ 27.00
Billets, Bessemer	33.00 @ 34.00
Bars, iron	1.70 @ 1.80
Bars, steel	1.75 @ 1.80
Rails, standard	28.00 @ 30.00
Rails, light	34.00 @ 40.00
Plates, holler	1.90 @ 2.00
Tank	1.75 @ 1.80
Sheets, 26 store	2.90 @ 3.00
No. 27	3.00 @ 3.10
No. 28	3.10 @ 3.20
Angles	1.75 @ 1.80
Beams	1.75 @ 1.85
Tees	1.80 @ 2.00
Zees	1.75 @ 2.25
Cannels	1.75 @ 2.25
Steel melting scrap	18.00 @ 18.50
No. 1 railroad wrought	18.50 @ 19.00
No. 1 cast, net ton	17.50 @ 18.00
Iron rails	24.00 @ 25.00
Car wheels	23.00 @ 23.50
Cast borings	10.25 @ 11.50
Turnings	14.00 @ 14.50

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 1/2c; less than one ton, 17 1/2c. No. 1*, 60% carload lots, 13 1/2c; less than one ton, 15 1/2c. No. 1** 50%, carload lots, 11 1/2c; less than one ton, 13 1/2c. No. 2, 40% carload lots, 10c; less than one ton, 12c. No. 2*, 35% carload lots, 9 1/2c; less than one ton, 11 1/2c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65;

Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10 1/2c @ set; 14 oz., 40s., 9 1/2c.

CHEMICALS.—Cyanide of potassium, 98%—99%, jobbing, 25 @ 26c @ lb.; carloads, 24 @ 24 1/2c; in 10-lb. tins, 35c; sulphuric acid, in carboys, 66% B, 2c @ lb.; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2 1/2 @ 3c @ lb.; blue vitriol, 5 1/2 @ 6 1/2c @ lb.; borax, concentrated, 7 @ 8c @ lb.; chlorate of potash, 12 @ 13c; roll sulphur, 4 @ 6c; ground sulphur, 4 @ 6c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2 1/2c; nitric acid, in carboys, 8c @ lb.; caustic soda, in drums, 3 @ 4c @ lb.; Cal. s. soda, bbls., \$1.25 @ 1.50 @ 100 lbs.; sds., \$1.05; chloride of lime, spot, \$3.00 @ 4.00; nitrate of potash, in bbls, 8c; caustic potash, 10c in 40-lb. tins; sulphide of iron, 9c @ lb.; copper sulphate, 5 @ 7c.

CEMENT.—Germania, \$2.50 @ 2.75; K. & B. S., \$3.00; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22 1/2c; Astral, 22 1/2c; Star, 22 1/2c; Extra Star, 25 1/2c; Eocene, 24 1/2c; Elaine, 27 1/2c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26 1/2c; Deodorized Stove Gasoline, bulk, 18 1/2c; do., cs., 25c; 86° Gasoline, bulk, 21c; do., cs., 27 1/2c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22 1/2c; Lard Oil, No. 1 bbl., 95c; cs., \$1.00; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 55 @ 57 1/2c; cs., 57 1/2 @ 60c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 60 @ 55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; 1 ton and less than 5 tons, per lb., 6 1/2c; 500 lbs. and less than 1 ton, per lb., 6c; less than 500 lbs., per lb., 6 1/2c; in 25-lb. tin pails, 7c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 7c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6 1/2c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Carbon, Eastern and foreign: Wallsend, \$6.50; Brynmor, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

RED LEAD.—One ton and over at one purchase, per lb., 6c; 500 lbs. and less than 1 ton, per lb., 6 1/2c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb.; powdered, 9 @ 12c; fused, 25 @ 30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ lb.

BORAX.—Crystall, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—(90% and over) 7 @ lb., \$1.25.

MOLYBDENUM.—25c. @ gramme; 1000 grammes—2 1/2 lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

MERCURY.—Bichloride, 7 @ lb., 90c.

PHOSPHORUS.—(American) 7 @ lb., \$1.00.

SILVER.—Chloride, 7 @ oz., 75c; nitrate, 55c.

URANIUM.—Oxide, 7 @ lb., \$3.50.

ZINC.—Metallic, chemically pure, 7 @ lb., 50c; dust, 7 @ lb., 10c; sulphate, 7 @ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

WANTED.

1 belt driven Air Compressor for 40 h. p. engine.
2 Automatic Ore Feeders.
2 large Ore Buckets.
1 Dynamo, 75 light.
1 Rock Breaker.
1 double cylinder Hoist.
40 ft. 3/4" Cable.
Must be in st-class condition and cheap. Locate and describe fully O. H. MCCONUGHEY, 628 Montgomery St., San Francisco.



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MINING AND SCIENTIFIC PRESS

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SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 7, 1903.

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The Leasing System.

There is a tendency in some mining States, and more particularly in certain districts, for large mining concerns to absorb all or most of the properties in their immediate vicinity, in this way forming large combinations. Such propositions give employment

mating separate industries of a single class under one management.

There is another and entirely different method of operating properties, whereby possibly the greatest profit may be realized, and in which a diametrically opposite course is pursued. This is the leasing system as generally practiced and which is much in

exploited vigorously at one time, employment is given to a greater number of men, and costs are reduced to a basis as low as—if not lower than—those obtaining at the large consolidations, for the leasers have an incentive which does not actuate men working under the wage system. The leaser is working for himself, and on his effort depends his



The Zinc and Fluor Spar Mines of Kentucky. (See Page 87.)

to a great number of men both above and below ground, skilled and unskilled. A single individual, the general manager, directs the destinies of the proposition, aided by a corps of capable assistants. Costs are reduced to a minimum under careful management, and in this manner some low-grade properties may become profitable, which, when divided into individual concerns, each with a manager or superintendent and staff, and usually also with separate metallurgical plant, gave only mediocre results or possibly failed to pay at all. The profitable consolidation of these several properties under a single management illustrates the advantages of amalga-

vogue in Colorado. Instead of absorbing all the surrounding territory, single claims or groups of claims are subdivided into relatively small tracts and the several sections leased on a basis of percentage of output to individuals, associated or singly, or to corporations organized for the purpose of working properties under lease. There are many mines the output of which singly is too small to justify a mill, smelter or other reduction works, and these in the hands of leasers make a profitable production under the leasing system, impossible or at least unusual when operated by a single company or individual. By the leasing system the several portions of the mine are being

success, and he will usually see to it that there are no drones in his hive of industry. By this system no extravagance is permitted, high-salaried officers are dispensed with, everything is done in the most direct and economical manner, and there is no waste either of energy or material. Where a number of leasers operate separate blocks of adjoining ground a common expense is often shared by all, such as handling water, or cost of dead work for ventilation, etc. As a result the leasing system, as generally conducted, is prolific of satisfactory results, and it will compare favorably in methods and economy with those of some great concerns making records in mine enterprises.

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San Francisco, February 7, 1903.

TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
The Zinc and Fluor Spar Mines of Kentucky.....	81
The Mortar Block Tilted and Ready to Place.....	84
The Mortar Block Slipping Down to Its Place.....	84
Diagram Showing Efficiency of Various Nozzles on 24-Inch Pipe	85
Quadruple Horizontal Pump, Iowa Mining Co., Fresno Co., Cal.	86
Cube Illustrating Ratio of Crushing Force.....	86
Map of Northern California, Showing Progress of Topographic	
Surveying.....	88-89
Mining and Metallurgical Patents.....	90
EDITORIAL:	
The Leasing System.....	81
Points in Mining or Metallurgical Practice.....	82
The Strength of Materials in Mines.....	82
Powder Magazines in Mines.....	82
Advance in the Price of Copper.....	82
MINING SUMMARY.....	91-92-93-94-95
LATEST MARKET REPORTS.....	96
MISCELLANEOUS:	
Concentrates.....	83
Stamp Milling and Amalgamation of Free Gold Ores.....	84
Statistics of Mineral Production for 1902.....	85
Use of Wood Ashes.....	85
The Most Effective Nozzle.....	85
Misconceptions in Mining, With an Example.....	85
A Quadruple Horizontal Pump.....	86
Henry A. Vezin.....	86
Storeroom and Storekeeper for Well Organized Mines.....	86
Pipe Line for Compressed Air.....	86
California State Mining Bureau.....	87
The Fluor Spar and Zinc Mines of Kentucky and Illinois.....	87
Topographic Maps and Geologic Folios of California.....	88
To Make Good Solder.....	88
American Methods in Manufacturing.....	89
To Convert the Power of Glaciers to Commercial Uses.....	89
Mining and Metallurgical Patents.....	90
Personal.....	95
Commercial Paragraphs.....	96
Books Received.....	96
Catalogues Received.....	96
Obituary.....	96
Notices of Recent Patents.....	96
New Patents.....	96

SO far in 1903, even more frequently than in former years, come requests for articles on or information concerning some points in mining or metallurgical practice, such requested information having frequently been given in just the shape asked for in some recent issues. This fact illustrates the tendency to overlook or forget. It is further exemplified by the occasional receipt from a friend or admirer of a marked article in some contemporary, suggesting that that should naturally have appeared first in this journal, when as a matter of fact the article did so first appear herein, but so long ago that it had become common property and its worth having been tardily recognized by some less enterprising contemporary, it had been given place without credit to its original source. The subject is cited merely to suggest that it were well to follow the example of so many readers of the MINING AND SCIENTIFIC PRESS who file their copies for reference and have them bound at the end of each six months. In no way can a better or cheaper mining and metallurgical library be secured, and when some particular data are required on some important present point it is almost certain that reference to the index in the closing pages of some recent volume will give the very information wished. While on this subject it may be further said that the numerous requests for republication of articles cannot well be complied with. That would argue a poverty of resources and the vast amount of matter constantly pressing for attention would accumulate in even still greater degree. This last may answer the queries: "Why don't you write of the need of a cabinet department of mines and mining?" "Why not make present argument for repeal of the extralateral apex clause and amendment of the federal mining law?" Those things have been discussed herein, the reasons plainly set forth, and repetition would only weaken the argument. There are many other things that deserve discussion and it is not the province of a progressive journal to thresh over old straw.

The Strength of Materials in Mines.

Considerable careful study has been given the strength of materials by engineers and it has been reduced to an absolute science. In the construction of buildings, bridges and other structures above ground, where the atmospheric and other conditions are practically constant, and where the materials employed, whether wood, iron or steel, do not deteriorate to any marked extent during a long period of time, the theory of the "strength of materials" is of great value to the constructing engineer, but those in charge of planning and supervising such structures, if not technically educated, are more likely to employ an unnecessary amount of material than too little. This is often evidenced in the construction of large and expensive wooden headframes at mine shafts, where the main members of the frame are frequently so placed that they bear no direct relation to the strains the structure will have to withstand. True, the frame answers the purpose, and endures a decade or more, but one-half the cost in materials, and labor properly directed, would have provided a finer appearing frame, answering every requirement and having at the same time an abundant factor for safety.

The strength of materials is a subject which receives only passing consideration, however, by the "timber boss" of a mine, except relatively in a general way. If ground is known to be "heavy" he selects a larger timber than if it is known to be fairly good. He knows from experience that timbers will not perfectly sustain rocks or "ground," as he calls all kinds of rock, when it begins to "come." If he cannot quickly fill the excavation with waste rock and in that manner forestall the threatened cave, he must let it come, for if the danger be imminent no amount of timber he would have time to place would sustain the ground. A careful observer, but one inexperienced in mining, might reach the conclusion in passing through a mine that more judgment should be exercised in the selection and placing of timbers, particularly where he sees certain portions of the workings heavily reinforced by timbers recently placed. There are many cases, of course, where such a conclusion would be justified by the condition of things, but under ordinary circumstances such is not the case.

When the excavation is first made, timbers are or are not put in, as the condition of the ground may require. Or there may be a choice between heavy and medium-sized timbers. Supposing a timber to have been necessary at once. It is selected as above stated with reference to immediate necessity. The moment timber is taken into the mine it commences to deteriorate rapidly—some kinds much more so than others—in this respect differing from materials in structures on the surface. In a few months, or possibly weeks, the rocks through which the mine workings pass begin to settle. The air has penetrated them through fissures, cracks and pores; they become "heavy," and the timbers show signs of "weight" where the several members of a set come in contact, at the joints, or where they abut on the walls, and the lagging also gives warning of the threatened collapse. The miner notices this as quickly as a mariner notes the signs of an approaching storm, and watches it carefully from day to day. Often after a certain amount of pressure has made itself evident, it seems for the time to progress no further, and thereafter it may be many weeks or even months before this "piece of ground" is considered dangerous; when, if it is desirable to keep the workings open, the necessary steps are taken to prevent caving. This may be accomplished by re-timbering, decay having weakened the original timbers, or by reinforcing with additional timbers, to sustain the ground for a further period. If in a stope, filling should be, and usually is, resorted to. Some of the most disastrous caves in mining history have been due to neglect to promptly attend to this matter, and still the miners knew that the timbers would not long sustain the great weight resting upon them.

In addition to the weight of the rocks immediately adjacent to timber sets, the fact that the "ground" is in motion to a greater or less extent—depending somewhat upon the development of the mine on levels above and below—results in the weight and pressure being shifted from one direction to another. In fact,

the conditions are constantly changing and the miner is unable to figure upon the "strength of materials" with that nicety which comes within the range of practice of the constructing engineer, who calculates upon a set of conditions in which the factors are essentially constant.

The economies of the proposition also enter into the miner's calculations to a great extent. If he knows the work is not to be of permanent character he proceeds accordingly, and makes no unnecessary expense in uselessly heavy timbers, but meets the immediate necessities in a practical and usually satisfactory manner, wasting little time on theories which experience has taught him serve no useful purpose. In this respect the methods of the trained and practical mining engineer and those of the practical, though unscientific, miner differ little.

Powder Magazines in Mines.

The advisability of storing nitro powders in mine workings is brought prominently into notice by the introduction recently into the Utah Legislature of a bill prohibiting the storage of powder in the mines, presumably as result of the recent explosion in the Daly-West mine at Park City, in that State. The opinion of mining men is about evenly divided on the subject, some managers seeing no disadvantage or danger in the practice, others being of different opinion. The fact that large amounts of nitro powders are daily consumed in mines does not appear to be sufficient reason for storing it in large quantities in underground workings without taking the precautions necessary to avoid a disaster similar to that above mentioned.

The practice of keeping even so small a quantity of the dangerous explosive as even two or three boxes at shaft stations, or at any point along a main gangway, where men frequently pass, or at any point on the main line between the working faces and the means of exit, should be strictly prohibited, if necessary by legislation, as in such situations the powder is a constant menace to the lives of men employed. Nevertheless the construction of an underground magazine in a dry portion of the mine has been recommended, as it keeps the powder at uniform temperature, but it should be located on a level either practically abandoned or little used, and at a distance from the shaft or main adit. When this is done but one man on each shift should have access to the magazine, he to supply the several levels with powder by the box as needed. Under no circumstances should detonating caps be stored at the same place as the powder, whether in the magazine or at the priming bench, but should be kept several yards apart. Nitro powders can readily be exploded without the employment of the caps, but as a matter of fact few explosions of this character occur where the cap is not a factor. It is a subject which should receive careful consideration, as the practice is not uncommon, and accidents are not infrequent from carelessness and violation of common sense rules regarding it.

EACH week notes an advance in the price of copper, and it is now slowly, but surely, nearing 13 cents per pound. That it would quickly go to that figure and beyond, were there not some powerful restraining influence, there is no doubt. The failure of certain large producers to report truthfully, or at all, their production has created a feeling of distrust in the market, and it is generally assumed that the statements of "stock on hand" at the first of the year were very unreliable. The great combination appears to be disintegrating, as one large concern after another withdraws from the pool known as the Copper Producers' Association, apparently owing to lack of good faith. For some time past it has been reported that the large producers were gradually approaching a basis of proportionate production, expecting in this way to control the output and price, in a manner similar to the quicksilver pool, in which the principal producers of that metal in America were concerned some years ago. That a pool of this character would have a great influence on the market there is no doubt, but it has always been difficult for the managers of such pools to hold these combinations with a firm hand, and sooner or later dissatisfaction disrupts the arrangement, which is followed by demoralization of the market.

CONCENTRATES.

HOT-AIR ENGINES can not be operated to advantage with air heated above 350° F.

WHEREVER there exists a difference of temperature motive power can be produced.

AN assay ton is equal to one ounce troy. There are 29,166 assay tons, or troy ounces, in one ton of 2000 pounds avoirdupois.

THE Denver, Colo., average price of silver during 1902 was 52 13 cents per ounce; lead, \$3.50 per 100 pounds; copper, 11.17 cents per pound.

WHEN an acid is added to a cyanide solution containing zinc and also an excess of ferro cyanide of potassium, the zinc is precipitated as ferro cyanide of zinc.

A BODY falling through space, at 1070 feet from the point of starting has acquired a velocity of 254 feet per second, and at 4000 feet is moving 507 feet per second.

IT is a curious fact that rubber belts when run constantly, and not overloaded, will last longer with reasonable care than the same belting rolled up in the storehouse.

FORTY YEARS AGO, this month, in the Florence, Idaho, gold rush, butter brought \$3 per pound, cheese \$1 50, sugar \$1.25, flour \$1, coffee \$2. The gold brought \$12 per ounce.

OSMIUM has the highest melting point of any metal, about 2600° C., and can be used at a higher temperature than carbon in an incandescent lamp, making the efficiency correspondingly higher.

THERE are two chlorides of gold, viz: Au Cl and Au Cl₃. The latter unites with hydrochloric acid and forms the liquid with which photographers are familiar and commonly known as chloride of gold.

RAILROADING is as positive a science as chemistry. The recent recurrence of railroad "accidents" means attempted operation of railway trains in ignorance or defiance of such scientific requirements.

THE function of a steam governor is to act in accord with every variation of the load, and to so limit the quantity of steam to be admitted to the cylinder as to overcome the resistance of the load, thus maintaining a uniform speed of the engine.

MACHINE DRILLS operated under thirty pounds pressure do not do effective work. The drills will last much longer, but the results accomplished by employing a pressure of ninety pounds per square inch will greatly more than offset the cost of wear and tear and of new machines.

THE actual weight of water in a pipe line 12 inches in diameter and 1000 feet long would be 24,486 + tons. The pressure per square inch at the lower end would vary with the difference in height between the upper and lower end, as it is the height of the column of water that determines the pressure.

THE Corliss engine was invented by G. H. Corliss in 1819. Its main feature is the admission of steam to the cylinders by the action of a governor, to determine the point of cut-off at which a liberating valve gear shall act, thus allowing a certain amount of expansion to take place in the cylinder before the end of a stroke is completed.

SHARING DIVIDENDS with the mine employes is not unusual and appears to work satisfactorily. The latest noticed was by Manager Wood of the Ouray Chief, Colorado, mine, who last summer started to allow all the mine employes 10% of all the dividends declared, in addition to their regular wages, the bonus being divided among them pro rata.

GRAPHITES are largely used in pigments and vary in efficiency according to the percentage of pure carbon contained, the form it takes, and the nature of the foreign substances with which the pure carbon is contained. The graphites do not, however, as a rule, adhere well after the first coat, owing to the siliceous nature of the foreign substances so contained.

DOLOMITE is composed of carbonate of calcium and carbonate of magnesium. It forms large rock masses. Much marble is dolomite. Dolerite is a basic igneous rock, composed essentially of lime soda (plagioclase), feldspar, and augite with magnetite and olivine. When olivine is predominant and the feldspar absent the rock is called limburgite, from its occurrence near Limburg, Germany.

IT was stated herein some months ago, but not officially, that the Chilean Government offered a reward of \$20,000 for the introduction into that country of a successful chemical process for the production of copper,

and that the Chilean Government would contribute \$100,000 toward the cost of installation of a suitable plant. The trouble as reported at the time was to the effect that the price of coke, obtained from England, had increased so much as to preclude profit by present processes.

IN rope transmission the sheave should not be less than forty times the diameter of the rope employed, and the groove must be suited to the size of the rope. A sheave turned for Manila rope should have a U-shaped groove. That for wire ropes more nearly approach a V in form. A wire rope should not be run in a groove cut for a fiber rope, or a fiber rope run in a groove cut for a wire rope. In the latter case the fiber rope will cut rapidly and soon break, even if the load resistance be light.

THE treatment of 100,000 tons of uranium residues would probably not result in the production of a kilo of radium. The present market price of radium in this country is \$450 per gram, or, approximately, \$2000 per pound. Radium requires no exposure to light to become incandescent, but will glow for an indefinite time, measured by years, with self-contained luminosity, and has also the property of causing other substances near it to become radio-active, and to retain this activity in some cases for a long period.

AERIAL or wire rope tramways are in successful use in great numbers in Colorado, California, Utah, Wyoming and elsewhere, and are of great commercial advantage. Their first cost and cost of continuous operation can hardly be stated except in the most general way. There are wire rope tramways in Colorado and Utah where the cost of handling ore, including the cost of all repairs, has not averaged more than 4 cents per ton for a year at a time; and there are others where the cost was as high as 25 cents per ton. The difference lies in the original construction and method of maintenance.

WHEN assay samples are pounded in an iron mortar and then ground on an iron "bucking plate," a greater or less quantity of metallic iron is inevitable in the sample, the amount depending upon the hardness of the material—the harder the rock, the greater the quantity of iron. The assayer weighs out his charge with greatest care; and as no account is taken of the metallic iron, the resulting "button" of gold or silver must represent the quantity contained in a lesser quantity of ore than is calculated. This being the case, the amount of gold in a ton of ore is really slightly more than is indicated by assay.

A SMALL quartz mill might be operated by a windmill under favorable conditions—that is, a steady wind of sufficient force to accomplish the desired result. A modern windmill, 20 feet in diameter, will give from 1/2 H. P. to 7 H. P., the velocity of the wind ranging from 8 to 30 miles per hour. A 30-foot mill will give from 2 H. P. to 12 H. P. with the wind varying from 8 to 30 miles per hour. The extreme variability of the wind in most places and the relatively low efficiency of the mills make them generally unsuited for the purpose of operating quartz mills, which require steady power, more particularly where concentrators are in use.

THE difference between rhyolite and felsite is difficult to determine by those unaccustomed to studying rocks scientifically. Rhyolite occurs in sheets and dikes. It has a compact ground mass, in which mica and small feldspars may often be seen. When quartz occurs in visible blebs the rock is called laparite. It is gray, red, brown, violet-brown and other colors. Felsite is light ash gray when fresh and has a close ground mass like rhyolite—sometimes greenish, or bluish, is hard, and contains no visible crystals. When quartz is visible the rocks become quartz porphyry. Both rhyolite and felsite, with their several variations, are associated with important ore deposits.

GYPSUM (calcium sulphate) occurs usually crystalline, sometimes compact (alabaster), or fibrous (satin spar) and crystallized (selenite). These minerals, though frequently mistaken for other substances, are easy of determination. Selenite, occurring in transparent sheets, with perfect cleavage, is often mistaken for mica. It is harder than the latter, and if subjected to a comparatively low heat, as on a stove, quickly turns white. Anhydrite is also calcium sulphate, and occurs with gypsum. It is somewhat harder than gypsum, and usually has a crystalline granular structure. It is distinguished from marble and dolomite by not effervescing with acid and by absence of water.

WHEN one says "nitre," potassium nitrate is understood. It is also known as saltpetre. Artificially it is obtained from the refuse of sinks and stables, in soil mixed with wood ashes to furnish the potassium. The greater portion at present is obtained from the sodium nitrates obtained in Chili, by treating it with potassium chloride. These salts are dissolved in hot water, when they decompose with the formation of sodium chloride (common salt), which separates from the hot solution and is removed, the potassium nitrate crystallizing on the solution becoming cool. Potassium nitrate is a powerful oxidizing agent and is employed in metallurgy. Its use in assaying is commonly known.

FOR heating mills and other buildings about mines where the motive power is steam, there is no economy in

using live steam direct from the boiler as all of its expansive power is lost, the only result being heat, and this can be obtained from the exhaust steam. In employing exhaust steam for heating purposes, provide ample sized pipe lines and the heat can be carried a much greater distance and will give much more effective results. Where desirable or necessary the condensation from the exhaust may be collected in a tank and the water returned to the boiler, but this point of condensation must be far enough removed from the engines and so arranged as to prevent the oil from the lubricators entering the condensed water.

AIR COMPRESSORS can not be satisfactorily utilized to operate power drills, running the air direct from the compressor through the pipe line to the drills. A receiver should always be provided at an intermediate point, and, if the line be long, two receivers are advisable, one near the compressor and one at the nearest point available to the drills. At some mines having auxiliary steam power plants, when the boilers are not in use as steam generators the air lines are connected with the boilers, thus largely increasing the storage capacity and rendering more uniform efficiency. When steam boilers are used in this manner the air may be reheated by keeping a moderate fire underneath the boilers, greatly increasing the expansive force of the air thereby.

"FINE GOLD" is obtained from bullion and alloys by "parting." That is, by dissolving out the base metal with hot nitric or sulphuric acid. For this purpose the metal is usually granulated. Should more than 25% gold be present the refiner adds sufficient silver to reduce the alloy to that value, as, with over 25%, pure gold will not result when treated with acids. Gold may be refined by melting with borax and then passing a stream of chlorine gas through the molten metal. The metals other than gold are converted into chlorides, which can be poured off as soon as the gold has become solid by cooling. As neither of these processes leave absolutely pure gold, when it is desired, the refined gold is dissolved in nitro-hydrochloric acid and precipitated from the solution by oxalic acid or ferrous sulphate.

FOR economical transmission of compressed air the velocity of the air in the main pipe line should not exceed 20 feet per second, and in the small laterals it should be much less than this. Several formulas have been suggested to give a coefficient of friction in pipes, but none of them are satisfactory, as actual practice and experience has demonstrated. The main factors entering into a calculation of the flow of air in pipes are: Unit of time, volume of air, pressure of air, diameter of pipe, length of pipe and difference of pressure at the ends of the pipe, or the head required to maintain the flow, none of which can be given its true value, as each is in a measure dependent on the other factors. Assuming the flow of air to be uniform at the entrance to the pipe, the volume and flow are not uniform after that. The air is constantly losing some of its pressure while the volume is constantly increasing. The velocity of flow is also somewhat increased continually. This also modifies the length of the pipe line as a constant factor.

PHONOLITE is a rock which has attracted much attention in late years owing to its association with important ore deposits in Cripple Creek district, Colo., and in the northern Black hills in South Dakota. It contains as essential constituents an alkali feldspar, elæolite or nepheline, and hornblende. The typical phonolite is described by Zirkel as nepheline-trachyte. It has a compact ground mass, which in its fresh state is dark greenish or yellowish gray. The mass shows a great tendency to fracture in slate-like slabs, and one of these gives out a sharp clear sound when struck, whence the name, but as some other compact rocks can be made to produce similar sounds by striking them this is an unreliable test. The rock is of no particular value or importance in itself, as its occurrence is not always an indication of an ore body in contact with it, or, in fact, anywhere near it. Phonolite exists many miles from any known ore deposits, and other and more familiar rocks are as likely to be found associated with mineral veins.

LIEN LAWS are supposed to protect workmen from loss by failure of their employers to pay them for their time, but the California law, while securing a certain class of workmen at mines (those employed on the surface) does not protect the miner who works underground, the Supreme Court of California having held that that section of the Code of Civil Procedure providing for the giving notice of non-responsibility by the owner of the land or mine, when buildings or improvements are being constructed thereon with his knowledge, does not apply to labor performed underground in the mine. A bill has been introduced in the California State Legislature which is calculated to remedy this defect in the law and afford protection to the miner equally with other workmen, and it will also make any person holding a contract to purchase a mine, and developing or working the same under bond the agent of the owner, thus making the property responsible for the debts of the contractor. Should this bill become a law, there are few property holders who will be willing to turn their property over to promoters or others on a lease and contract to purchase unless such contractor put up bonds to secure the owner against loss by failure to meet the obligations incurred.

Stamp Milling and Amalgamation of Free Gold Ores.

NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by DANA HARMON, San Francisco, Cal.

CATCH THE GOLD CLOSE TO THE DIE.—This requires a roomy, rather than a narrow mortar. You can't churn hutter in a teacup, and you must churn if you want to amalgamate. You can't churn with a low, gravel mill style of discharge.

Whenever I neglect my inside catchment the tailings run up. Set the discharge too low and the mortar will throw out on the plates. It is the province of the plates to catch the fine gold, not the coarse. Coarse gold will roll down hill, and the table is a downhill proposition. Coarse gold makes good sized hits of amalgam, and the natural habitat of these is inside the mortar.

On quartz make the discharge $5\frac{1}{2}$ inches at the start, i. e., $5\frac{1}{2}$ inches depth of water measured from the top of the die to the bottom of the screen opening. Starting with this, and with a 6 or 7-inch drop, you will soon have $5\frac{1}{2}$ inches discharge. We will say now that the wear of the die is 2 inches in the month's run. This would mean $7\frac{1}{2}$ inches discharge

build with amalgam, and has also seen it scoured red, in whole or in spots—scoured, we are told, accidentally. Let us dissect this "accident."

Every battery is liable to be filled up with sand. Feeders fail, faucets choke, millmen yawn or are busy elsewhere—no matter the reason, true it certainly is that every battery fills up sometimes. It is

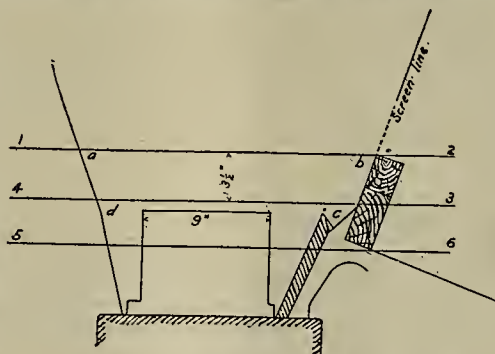


FIGURE 6.

MINING AND SCIENTIFIC PRESS

this fill of sand that scours the chock block. Amalgam once scoured off, is rebellious metal—it is round and hard, it gets out on the plates where it rolls and tumbles, scorning to stick, content only when it

set of the mill's life to make exhaustive tests with screens. The wave motion—i. e., deep discharge with shoe always under water—increases the sliming.

Don't crowd plates with too much pulp.

Don't sluice the pulp over the plates.

Don't be afraid of steep tables.

No distributing boxes.

Don't add water outside the mortar.

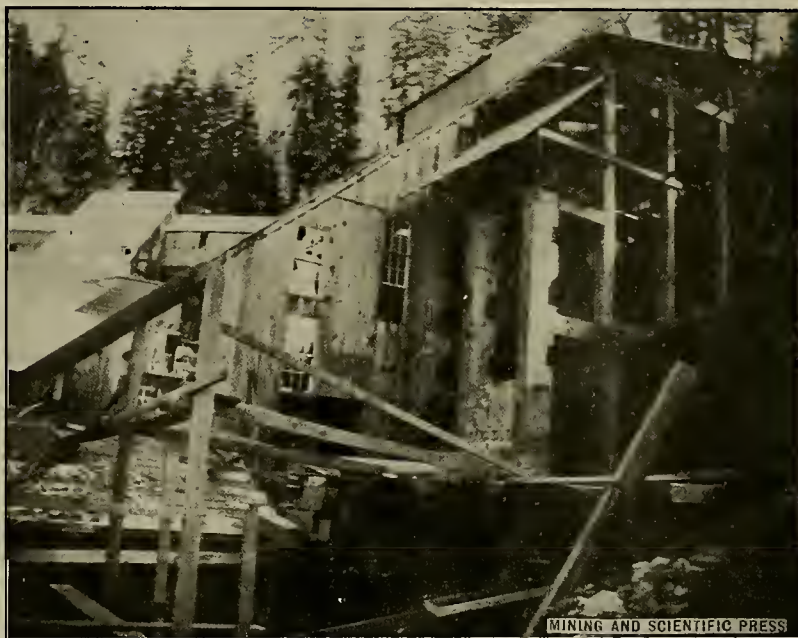
These five rules may be treated together.

It is not easy to set down in words just what the conditions of the pulp should be. It is a question to be determined by the eye. Millmen who say they can run their mill by ear should be fired. For these are they who in summer time pick huttercups, or watch the goats gambol on the hillsides outside the mill, and in winter hug the stove in the retort room, poring over some daily or a dime novel. Many a mill owner has suffered because his millman makes of the battery floor a postoffice address. Fortunately for the business, the majority of the millmen are not of that ilk. The point I wish to bring out is that the ear is not a safe guide for the reason that sand does not make noise as it flows over the plate and it is of the utmost importance that the flow be of the right kind.

Plate amalgamation and ground sluicing are two different arts. The first adherence of gold to the plate is quite tenacious if the plate be pasty. Effort must be directed towards forcing the gold to touch the plate. Gravity settles the metal upon the silvered surface. But this is not the only force at



The Mortar Block Tilted and Ready to Place.



The Mortar Block Slipping Down to Its Place.

at close of the run, and would diminish the crushing. To cure this, make one screen frame with 3-inch strip on bottom and 2 inches on top edge; make another screen with 1-inch strip on bottom.

As the run progresses you can change and turn screens so as to preserve a practically uniform discharge.

The drop is regulated by the tappet. Note that the shoe is lifted above the water, the start being made with $5\frac{1}{2}$ discharge and 6 to 7-inch drop.

There is no harm in using a $6\frac{1}{2}$ to $7\frac{1}{2}$ -inch discharge. But there is no gain to amalgamation, and you diminish the crushing capacity of the mill. In other words, work so as to obey the injunction, "Get through all possible consistent with full recovery of the gold."

Some interesting experiments were made at the Utica and Gwin mines on mortar shapes for 900-pound stamps. The hack of the mortar was straightened to 77° . At the discharge line the distance from shoe to back is $2\frac{1}{2}$ inches and to screen $5\frac{1}{2}$ inches. It was found that this mortar would crush five to five and a half tons to the stamp on Utica and Gwin ores, whereas the wide mortar crushed four to four and one-fourth tons—this with No. 2 tin.

I attempted to apply these lines to an 1100-pound mill, but did not increase the crushing, and can only attribute the failure to the fact that the heavier and larger shoe makes a more vicious splash. You can not bring the screen closer than $7\frac{1}{2}$ inches to the shoe. On identical ore the Fig. 1 mortar will out-crush this straight hack Utica mortar, and it is a better amalgamator. Outcrush it because of the greater weight and shoe area.

NO CHOCK BLOCK OR INSIDE COPPERS.—A copper plate in the mortar will attract amalgam. But copper is no greater magnet than is amalgam itself. Start a bed of amalgam in some secure cranny around the dies and you will have as eager an ally. Grooves in the liners are all humbug—they only shorten the life of the liner.

Nobody ever used a chock block hut has seen it

lands in the concentrates or in the canyon. If in the canyon, it is lost for all time. If the buyer of your sulphurets happens to get a hit of it into his sample he rejects the sample as abnormal—these men may be appropriating, they certainly are not huying abnormals. The millman blames the accident he himself has concocted—he has sandbagged himself—for the chock block lies within the zone of scour. Study this diagram, Fig. 6.

Particles of gold and amalgam are flying about within the area a h c d.

These particles can be attracted upward to the chock block or downward below the line 3, 4, as you please. If you use a chock block they will fly to it. If you don't, they will sink around rocks—every particle lodged will attract another; soon it will be a mass. But note the difference; the chock block lying within the zone of scour 1, 2, 3, 4, your caught amalgam is in danger of loss. The zone 3, 4, 5, 6 being below the line of scour, your caught amalgam is safe till cleanup day. Millmen may sleep, faucets clog, feeders huck—your amalgam is safe.

You will find the entire front of the mortar below the line 3, 4 one mass of amalgam—cakes $\frac{1}{2}$ inch to $\frac{1}{4}$ inch thick—this on ore so low as \$5 to \$7 per ton.

Take the year through and you will catch more gold inside without chock blocks than with them.

Another important advantage is that in case of overfeed of quick this excess will be safely absorbed by the mass of amalgam around the dies. Excess of quick on a chock block is fatal—it sloughs off the amalgam.

When one considers the varied duties of the millman and the sudden variations of gold ores there is full warrant for abandoning the chock block.

DON'T SLIME BY TOO FINE CRUSHING.—Especially vicious is this practice on slate ores. The correction can only be located by assaying the tailings through different meshes.

If you slime, you are also wasting power by dead—i. e., useless—stamping. It is a common error, this using too fine a screen. It will pay at the very out-

work. There is another, which, for want of a better single term, may be called propinquity. Don't be in a hurry to sluice off the sand, and don't throw obstacles in the way of these two natural laws. We are now down to the very kernel of amalgamation. We are pursuing the fine gold. A millman who has always worked on \$15 to \$30 ore will be a poor hand on \$3 ore. He has to learn much that has hitherto never entered into his philosophy or dreams.

The pulp must not be too thick on the plates—you don't want a double deck of sand. Furthermore, there should be an even flow of water over the entire plate area. It is for this reason that the center of my plate is $\frac{1}{8}$ inch below the edges—to draw the water away from the edges. Batteries tend to a greater discharge in the corners than in the center. It is a common sight to find a rush of water 4 inches to 6 inches wide along both edges of the table—one-fifth to one-fourth of the plate area is overflowed.

The sand should move over the plates slowly and evenly; the water will go in waves or pulses, while the sand below it will be kicked along by these successive waves, not moving any faster over the last 2 feet than it does over the first 2 feet of the table. Between the waves the sand almost, but not quite, comes to a standstill. Note this point especially: The sand is kicked along; it must never be swept along by a heavy flow of water.

Have a wave and use it. It is these successive kicks that tumble the sand about; before the last plate is reached the gold is kicked into its proper place, viz: to some sticking point. The $\frac{1}{2}$ -inch drop every 2 feet assists the process in two ways: (a) the drop howls the particles over; (b) it prevents acceleration of flow. A drop greater than $\frac{1}{2}$ inch creates too much disturbance and scours the plate.

With this thin, carefully regulated flow and a sticky, pasty plate, good amalgamation will be had. Note the words "sticky and pasty plate." This is in direct contradistinction to the "hard plate", which I do not advocate. The 17-inch lip plate is always hard and is never to be softened with quick

during the run. But from this point down the plates should be kept sticky and pasty—the apron plate will be stiffer than the others, by reason of its making the larger catchment.

Many mills have tables 24 feet long with no break in grade. Drop a cork chip at the head of such table, and at the same instant another chip at the middle. You will find that the second cork will travel its 12 feet in less time than the first one, because the velocity of flow must be accelerated on such a table. If the flow is correct for the first 12 feet, it must be wrong for the second 12 feet.

A suggested cure is to reduce the grade for the last 12 feet. My answer to this is that 24 feet is entirely too long a plate run. The length of the table will depend upon the minuteness of the gold particles in the ore. On some ores 4 feet is ample. On others 6, 8 or 12 feet will be required.

My rule is to preserve the full 5-foot width of plate, maintaining all along the line a sticky, pasty condition until by absorption of the gold it is no longer possible to do so. The point will be reached where free quick, or "glassy" surface, will result. Stop the copper plates at this point. Experimenting on the ore is the only way to determine the length of the table.

This length of table is important, not because of the cost of original installation, but because of the waste of time brushing up an unnecessary length. A 12-foot table is long enough.

Another suggested cure is to give the pulp a run of 4 to 8 feet on a wide plate and to then turn it into a 20-inch plate-lined sluice, set on a grade of $1\frac{1}{4}$ inch per foot.

I thought we had buried this Banquo long ago. But it still crops up and perhaps will be an able-bodied seaman until Gabriel winds his horn. Various reasons are given in support of this theory:

(a) "Tom Jones has been using narrow sluices in his mill for the past forty years. He first used them in 1850 at his placer claim."

(b) "That practically all the gold is extracted after 1 or 2 feet run on the wide plate." If true, then the pulp is ready for the launder. I have never found it possible to catch fine gold on so short a plate run.

(c) "That barren sand or even clear water in quantity coming from a 5-stamp battery will scour and denude a wide plate." This is serious. The waters are deep with no raft in sight. Here are two one-ton lots of sand; one contains \$3 in free gold; the other no gold at all. Both go over the plates—have to, because my poor mine persists in turning out just such alternate mixtures. Will some one tell me which of the two lots is the denuding wretch? Nor can I with safety use even clear water. Let us quit the miserable business and turn scullion so that we can scour without damage.

(d) "That the greater depth of water in the 20-inch sluice gives free play to gravity in settling the metal to the plate." I cannot believe this—sluices don't operate that way. By the time that free gold has passed over 6 to 8 feet of wide plate the gold remaining in the sand is so light that gravity is not the force that compels it to touch the plate. It has to be coaxed there by the slow, gentle flow. It touches the plate because it is quietly forced there by the 4-inch drops and by the wave kicks. It would simply take a jolly good swim in a 20-inch sluice, and would finally elude you. I have spent so much time on my knees with eye as close to the plate as to a hook, trying to read the story told by the tiny waves, that I have become firmly convinced that these minutest particles of gold have little chance to escape from the wide plate with its thin, slow-moving sheet of sand.

With this same pulp on this same plate you can get a wide range of tailing's results by merely changing some of the other factors of amalgamation, viz: screen, amount of water, discharge or drop.

I insist upon holding myself down to the kind of amalgamation that I have been trying to describe. In this there is no place nor compartment for the 20-inch sluice. I am not concerning myself with other kinds of amalgamation, of which we see too much.

(TO BE CONTINUED.)

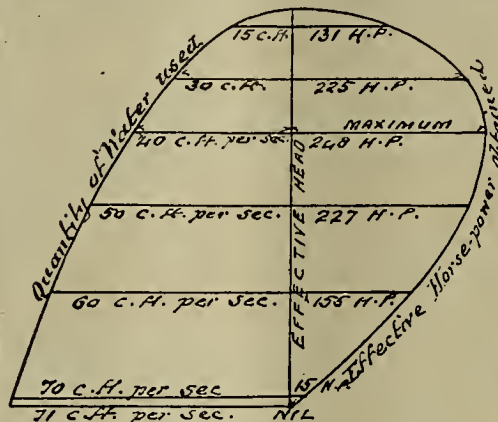
The State Mineralogist of California, L. E. Aubury, is sending out a circular letter to California owners of mines producing minerals other than gold and silver for the purpose of compiling statistics of production for 1902. The names of neither mines nor owners are to be mentioned in the report, only the aggregate amounts being published under each county head. All mineral States and counties annually publish through some official channel statistics of the mineral production of the State or county, and necessarily the officials in charge of this work must depend upon those owning or operating the mines for accurate information as to output, and as the information thus obtained is treated confidentially, miners would do well to respond promptly to these official requests for data.

An experienced millman says wood ashes can be used to assist in keeping amalgamated plates in good working condition where the mill is not run nights. After shutting off the power at night and brushing up the plates, wood ashes freely sprinkled over them, and wet, can be left till morning.

The Most Effective Nozzle.

TO THE EDITOR:—In current issue of "Concentrates" it is stated that "the greatest efficiency is obtained when the largest possible nozzle is employed which still permits the pressure tank to remain full of water, but without overflowing." This is only partially true, because a point is soon reached when the friction increases at a greater rate than the power generated. For example, a 24 inch pipe, 1000 feet long, with 100 feet head, yields about 90 effective horse power when nozzles discharging 10 cubic feet per second are used. A discharge of 30 cubic feet per second will give 225 H. P. and the maximum effect is reached when 40 feet discharge gives 248 H. P. Sixty feet discharge reduces the effect to 155 H. P., and 70 feet would give only about 15 H. P. (See accompanying diagram.)

Diagram showing efficiency of various nozzles on 24" pipe, 1000 ft. long, 100 ft. head.



Distinguish between "efficiency" and "effect," because the smaller the nozzle the greater is the "efficiency" of the water used. In this example when 10 feet are discharged each foot gives 9 H. P., but when the maximum "effect" is reached each foot of water gives only about 6 H. P.

The practical conclusion is that when water is scarce large pipes and smaller nozzles should be used, but when water is abundant a smaller pipe will suffice, and the maximum effect (not efficiency) will be obtained with nozzles large enough to reduce the static head one-third, as indicated by pressure gauge near the low end of the pipe. In this case the gauge would read about 29 pounds per inch when the maximum effect was being produced, and 43 pounds when the nozzles were closed. R. B. SYMINGTON, M. E. San Francisco, Cal., Feb. 2.

Many queries are received each week from every mining region. To publish these questions would require many pages. Concentrated answers to most of them appear on the third page weekly. The "Concentrate" referred to in the above communication was in answer to a direct question, wherein the inquirer asked whether the employment of a smaller nozzle with a full head of water did not result in greater efficiency than a larger nozzle with the same amount of water, which caused the head of the water column to descend to one-half the height in the pipe line. In reply "Concentrates" said:

"Effective results cannot be obtained with a nozzle of any size when the pipe line is full only half way to the pressure tank, nor is the fullest efficiency obtainable when the pipe at the pressure box is not entirely covered by water, as otherwise air passes down the pipe line with the water, destroying the fullest effect of the stream when delivered at the wheel. The greatest efficiency is obtained when the largest possible nozzle is employed which will permit the pressure tank to remain full of water, but without overflowing. The efficiency is further increased if the water is 2 or 3 feet at least above the top of the intake pipe."

In his communication Mr. Symington overlooks the real purport of the paragraph, which in its entirety is correct, and selects as a text the latter portion of the "Concentrate." Technically he is correct also, as it is well known that the greater the velocity of the column of water in a pipe line the greater will be the loss of power (called head) at the wheel. Hydraulic engineers estimate that when the effective "head" is lessened one-third by reason of friction in the pipe line the highest limit of efficiency has been reached.

Misconceptions in Mining, With an Example.

Written for the MINING AND SCIENTIFIC PRESS by J. H. SHOCKLEY, E. M.

There are, perhaps, more mistakes made in mining, causing lamentable failures and loss of money, than in any other line of business. In nine cases out of ten the reason of this can be assigned to an incomplete knowledge of mines and mining. True, there are instances where the unprincipled mine promoter gulls the public, but in the majority of cases the honest man, with perhaps a few years' experience out West, filled with boundless enthusiasm and an inflated imagination, is the one to whom the loss of fortunes can be directly traced. He is quite often the son of some high official or stockholder in some mining company, born and brought up in the East, with a good education, and his father feels gratified when he sees him start for the West, where after a few months spent in sizing up the situation he is placed in full charge of the work. Very often, however, some friend who is known to be perfectly reliable is selected for manager. He has shown by years spent in association with his friends in the East that he is entirely trustworthy and that they need feel no hesitancy in putting the mine in his hands. This particularly dangerous man appears also many times in the line of promoting. He has probably lived out West—near some mining district—for some time, been fairly successful in his business, and has dabbled in prospects until he thinks he knows something of mining, and finally resolves to try and float some mining scheme. This is comparatively easy for him to do, as his friends in the East endorse him not only with their money, but with endorsement as well to their acquaintances. The above class of men, of course, can have but an inkling of mining. They figure that with a good, reliable foreman in the mine, and a good, reliable millman in the mill, to advise with, they can make no mistakes. But in the simple example given below the conclusion is irresistible that in the majority of cases it pays to have men at the head of mining enterprises who, in addition to being honest, have a broad understanding of mining and a good knowledge of the crust of the earth, and that the mine manager who depends on his foreman and millman is indeed an individual to be feared by the public. No mining man can class himself as proficient who is not well posted in geology.

A few years ago a man who had lived several years in the West thought he had an opportunity in buying a certain mine, and for a considerable cash price, with the aid of his friends in the East, did so. He had no trouble in raising the money, for he was known as a reliable man in business, with experience and some reputation in mining.

When purchased the mine showed some good looking, large sized bodies of both smelting and milling ore, and it was figured that there was smelting ore in sight over the main tunnel more than sufficient to pay for the mine. The former owners were shipping regularly to the smelters and had a stope cut out several hundred feet in length which showed all along continuous ore. The extreme inside workings showed no ore and it was presumed the drift was off the vein in this part of the mine. A winze 50 feet deep or so showed good ore from top to bottom. The formation was granite, which was thought to be good, and the vein was very strongly defined. Operations were begun on a considerable scale—a large mill was put up, with boarding houses and everything for extensive mining. A large working force in the mine turned out heavy shipments of ore and things looked good for the investment. In a short time, however, the ore in the stopes showed unmistakable signs of playing out. Exploration for the vein in the inside workings, where it was presumed the old owners had left it, failed to show ore bodies. The winze on being sunk a little deeper suddenly ran into solid rock and by this time the stopes above the tunnel level were being cut off as abruptly as the vein in the winze. Nearly all the stamps in the mill—now completed, and which had been running full capacity for some time—were hung up for want of ore, and a lower tunnel driven in several hundred feet under the old upper workings had failed to disclose any ore bodies. By this time it was found necessary to shut down the mill entirely and only a few men were on ore in the old stopes, taking out what had been left in the out-of-the-way places. It was decided that the mine was faulted by a series of faults and very extensive search was made to find the vein.

After spending several hundred thousand dollars and two years' time it was decided to hire an expert mining engineer to look into the situation.

He was called to the mine in the middle of winter (several feet of snow was on the ground) and found it situated in the foothills of an extremely high, abrupt range of mountains. Even while going up the trail to the mine, peculiar conditions of the topography caused him to surmise certain things to be afterwards corroborated in the mine workings. Sure enough, the mine was in what is called granite by a good many, but of a hornblende, stratified type, found principally in the upper and outer edge of the

Archæan rocks, and which the mining engineer termed gneissoid schist. Upon entering the mine he found, in the part where the ore had been extracted, evidences of a well-formed fissure, pitching at about 45°, with two walls, and cutting across the formation obliquely, thus forming what is often termed a true fissure vein. It presented evidences of intense movement upon itself, as the ore was much crushed and contained great boulders of rounded ore, imbedded in masses of talc and corroded mineral matter. Not a drop of water was seen in the extensive workings, while the property lay in the foothills of a snowy range. Open cracks were noticeable penetrating the wall rock, evidently of recent date, for they contained no infiltrated matter. Great care had to be taken to secure the hanging wall in the stopes to prevent caving. In the top of the stopes the ore was entirely cut off, as was also the case in the workings below the main tunnel, and extensive work had failed to find any other ore except small hunches close to the main ore body. The ore had been continuous for about 400 feet horizontally and about 350 feet vertically. This block of ore was nearly square and the change from ore to rock was abrupt on all sides. The workings beyond the ore showed what miners aptly term a broken-up condition of the country rock, and, although everything had been followed which looked as if it might lead to more ore, no fissures were found that maintained themselves. Nothing was observed indicating any definite line of faulting.

On going over the surface and from the evidences collected there, such as a characteristically uneven appearance, with hills and hollows and rounded knolls, and abnormal outcrops of the formation, coupled with the evidences presented in the mine, the conclusion was reached that what the mining engineer first surmised on going up the trail was an indisputable fact, namely, the mine was located in a gigantic landslide, miles in area, and all the money had been expended on a segment of a vein at least 3 miles from its original position up the mountain.

A Quadruple Horizontal Pump.

The pumping plant of the Iowa Mining Co., Fresno county, Cal., consists of a setting of four 5-inch Jackson horizontal centrifugal pumps, arranged to work singly or compounded.

This plant, when compounded, delivers 1000 gallons per minute, at an elevation of 50 feet, through 1500 feet of discharge pipe with a pressure at the point of discharge of 115 pounds, and is used for hydraulicking purposes. This machinery is driven by a 62-inch Sampson water wheel. Another plant of this character is that of the Bay Counties Power Co., installed recently near Dobbins, Cal. This plant consists of two special 10-inch horizontal centrifugal pumps, compounded, is belt-driven, and works under a head of 400 feet. The efficiency of this plant is stated to be 74%. During the past six months the Byron Jackson Machine Co. of San Francisco, Cal., has supplied several pumping plants for irrigation and city water works east of the Rocky mountains. The Jordan River pumping plant near Salt Lake City, Utah, consists of four special 40-inch Jackson centrifugal pumps, having a combined capacity of 200,000 gallons per minute, each pump being belt-driven by one 100 H. P. electric motor. The pumping plant for the city of New Albany, Ind., recently supplied, consists of two specially compounded 8-inch centrifugal pumps and works under a head of 300 feet capacity of each 1400 gallons per minute. The plant for the city of Danville, Ill., consists of two special 12-inch horizontal centrifugal pumps with capacity of 5000 gallons per minute at variable heads. There is now in construction in the works of the company special pumps and apparatus for the cities of Fort Worth, Tex., and Elgin, Ill. Among city water works, pumping plants installed in California during the past few months are those of the city of Modesto, consisting of one 85 H. P. automatic steam engine, with special Jackson centrifugal pumps, which furnishes water for both domestic and fire purposes. The pumping plants for the cities of Woodland and Colusa consist of special Jackson high-head pumps driven by direct-connected electric motors.

[The above appeared in the issue of the 31st ult., but owing to a typographical error was misleading in its statement of the efficiency, which is in this issue stated correctly, viz., 74%.]

Henry A. Vezin.

Written for the MINING AND SCIENTIFIC PRESS by
CHARLES H. FITCH.

In reference to the life and character of Henry A. Vezin of Colorado, who lately passed away, I do not speak with any claim of intimacy whatever, scarcely of acquaintance in the ordinary sense; and yet, remote as he was, I feel a certain natural right to speak because he touched me, and I recognized the virtue, the punctilious integrity, of the touch.

I have already read several notices of his life, and have felt how little they said of him, how much they left to be said. The mining engineer, with his large and wealthy schemes, is, in many cases, a man disposed to ornament the truth, to treat his facts luxuriously, extravagantly, even recklessly; his "ore in sight" is an expansive quantity, and when it comes to the grand vista of a prospectus the mining expert has been harshly defined as the superlative of an untruthful man. Mr. Vezin was the antithesis of this. He was keen in his conscience of exact truth. In his insistence upon correctness of statement and detail he might have been thought by looser-jointed minds to be pedantic and fussy. This niceness of integrity went far to define him as a gentleman of the old school.

His feelings were aroused in any discussion involving the truth of principles. He was a hot opponent in advocacy of what he believed to be true. Like Pisanio, in Shakespeare's "Cymbeline," he was a man "not to be shaken" in the faithfulness of his opinions. From what is said by others, I judge his friendship to have been of the same loyal and enduring quality. Whatever other matters in ore reduction may have claimed his attention, I think of him chiefly in connection with the theory of crushing, for until I read his statement of this subject in engineering discussions, I did not realize that crushing had a theory. I can not speak by the hook in citation of his views, but the impression which they made upon me at the time and which appealed to me with the force of value and originality was that all crushing actions and results can be referred conveniently to a cubing fracture.

For example, if we have a cuhe and separate it

three times one face of said cuhes, area of these faces being one-fourth of original face, so that $8 \times 3 \div 4 = 6$ will give the area of cleavage for the second reduction in terms of a face of original cube. The total cleavage area for two reductions will be $6 + 3 = 9$.

If, then, we cube by two cutting into eighths, and again cube by two cutting into sixty-fourths, the power required by the second cubing is to that required by the first as 6 to 3, and the power to effect the finer subdivisions is to the power to effect the coarser subdivision as 9 to 3.

By extending the series we get a theoretical basis of comparison, to which we may refer any work of pulverizing to meshes fine or coarse.

Now, it is obviously true that crushing practically accomplished while an action of shearing or cleavage is not theoretical cubing; but in theoretical cubing we have a working hypothesis and standard of comparison to which all crushing can be referred. When a basis of this kind is established, science is established in the treatment of a subject, for all science is comparative and must be grounded upon standards of comparison.

I do not apologize for explaining this matter in its simplicity, because it is an instance of the comparative method on the lines of which all modern advances have been made—all advances out of the mist of guesswork and superstition into the light of clearly defined truth.

The exposition of this matter, at any rate, established Mr. Vezin in the opinion of the writer as a scientific man, and that, I fear, is more than can be said of some gentlemen on whom colleges have bestowed the degree of Doctor of Philosophy—an American habit neatly hit by Dr. Lorenz of Vienna when he said of his experience in Chicago: "Having some proficiency in surgery, I had to pass examination by the board of health; knowing nothing of law, they made me a Doctor of Laws."

Like most scientific mining men, Mr. Vezin preferred rolls to stamps as a means of crushing ore. The writer represented stamp mill makers, and from some argumentative correspondence he was led to think that Mr. Vezin allowed little field of usefulness for stamps. This correspondence was pursued with much earnestness of conviction until the head of the machinery house suppressed his employe, under the idea that such controversies hurt the business.

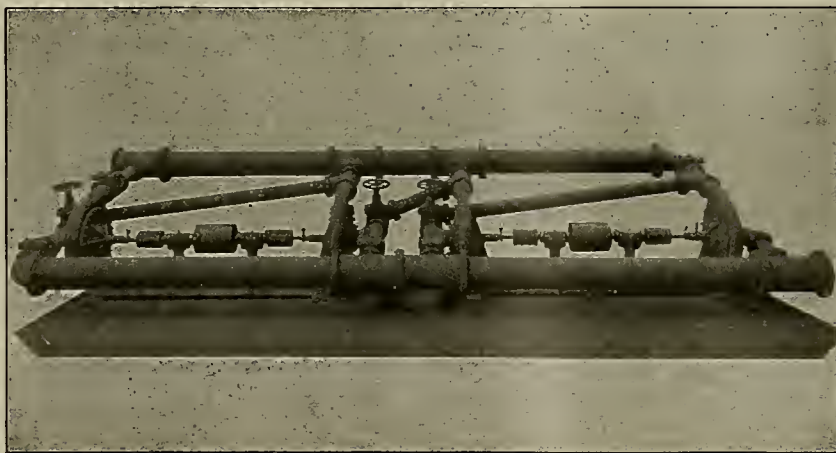
I believe that if two men get together in discussion on a scientific basis which admits of no pretense of insincerity, the result is a melting away of all difference of opinion, although one may be benefited by a peep at the common subject from the other's point of view.

There are two significant parallels in politics and in pulverizing. In politics our country in its prosperous years has been committed to a policy of protection, which has been steadily condemned by theoretical economists, such as Prof. Sumner, and, in fact, by all prominent in teaching political economy. In pulverizing, until within a few years, the vast preponderance of practice on gold ores has been committed to stamps, although stamps have been very generally condemned upon theoretical grounds. In these two things teaching has been opposed to practice, and why? This was the question raised by the writer in correspondence with Mr. Vezin several years ago. I had hoped to renew it when relieved of the espionage by which it was then limited, but the pressure of other matters intervened, until now when he has been called away. I believed then, and still believe, that there are two sides to this matter; but the increasing use of rolls in mills has demonstrated more and more largely the opinions in their favor advanced by Mr. Vezin. He wrote warmly, earnestly, like a true scientific man, zealous for the truth, keen to expose fallacies. Like a scientific man, too, he gave me his truth, frankly, freely, without dissimulation, not asking who I was, or whether I had any claim upon him, but as man to man, in his own manliness, in which, with all his sharpness of criticism, there was maintained the courteous hearing of the man who respects himself.

I never heard that Mr. Vezin made any great "stake" in his mining practice. The tributes of respect left at the grave of this veteran were tributes not to the material he had scraped together during his earthly career, but to the richest and most inalienable possession a man can make for himself, the truth and worth of his personal character.

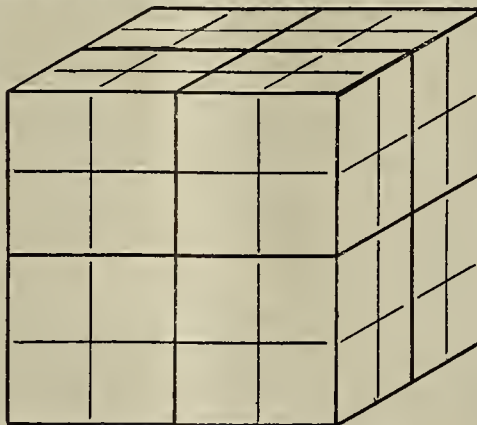
EVERY well organized mine should have a store-room and a storekeeper, whose duty it is to issue the supplies, such as nails, pipe fittings, candles, tools and the great variety of things to which the workmen in some places have free access, "because it saves time" and the expense of the storekeeper, but no record is kept under such conditions and the loss incident to such lax methods amounts to more than would pay for giving this department proper attention. One of the top hands—the carpenter or his assistant, or one of the timber framers—can usually be found who can do his work and also attend the store. At large plants a special man should be employed as storekeeper.

WHEN laying a pipe line for compressed air always provide valves at low places along the line, to afford an outlet to condensation of moisture within the pipe.



Quadruple Horizontal Pump, Iowa Mining Co., Fresno County, Cal.

into four equal smaller cuhes, the area of cleavage will be equal to three times the area of one face of the original cuhe. The power required to effect the separation will be proportional to this area of cleavage. If we now separate the smaller cuhes each into four in the next degree of diminution, the aggregate area of cleavage in this second division will be six times the area of one face of the original cuhe. This



Cube Illustrating Ratio of Crushing Force.

will be clear on inspection of the figure herewith. There will be eight cubes of the first degree of diminution, and the cleavage area in each of them will be

California State Mining Bureau.

Written for the MINING AND SCIENTIFIC PRESS by
W. L. WATTS, E. M.

An inspection of the statutory history of the Mining Bureau shows this department was established in 1880. The first State Mineralogist was H. G. Hanks, who was appointed in 1880.

The Mining Bureau was created in order that a systematic record might be made of the progress of the mining industry in California, and that the mineral lands of the State might be investigated and reported on by competent men, unbiased by local prejudice or personal interest. Also that a public museum might be maintained, wherein samples of minerals and other geological specimens might be displayed; special prominence to be given to specimens representing the mineral wealth of California, together with maps and models pertaining to mining, metallurgy, geology and kindred subjects. Also that a public library should be maintained of books, reprints and drawings, being on the subjects of mineralogy, geology, mining and metallurgical processes.

The executive power for directing the work of the bureau was to be vested in a State Mineralogist, to be appointed by the Governor of the State, the State Mineralogist to confer with the board of trustees in all matters of importance and to render a report to the Governor on the mining industry of the State.

At first the fund created for the support of the Mining Bureau was ridiculously small considering the scope of work which this department had been created to perform. A precarious stipend derived from funds arising from certain taxes on mining corporations and the sale of mining stocks was for a time its only support. To this an appropriation of \$5000 a year was added in 1883. Notwithstanding the meager exchequer of the Mining Bureau during the early years of its existence, much good work was done, and the annual reports issued by the State Mineralogist were valuable additions to the records of the State. Of necessity these reports were limited to a few subjects, and embraced more or less extraneous matter. In 1885 the Legislature appropriated \$20,000 for the support of the Mining Bureau.

In 1886 Mr. Hanks was succeeded by Wm. Ireland, Jr. as State Mineralogist.

In 1887 the seventh annual report of the Mining Bureau was published. This volume treated principally of the fuel of the State, and for the first time petroleum was considered an important factor to the mineral economies of California.

In 1887 the Mining Bureau received an appropriation of \$60,000, at least 50% to be used for geological work in the field. The greater portion of this sum was expended in finding out what minerals of economic value there are in California. This had to be done mainly by personal research; and it was no easy task in a State embracing 157,456 square miles.

The result of work done in 1887 and 1888 was published in the eighth annual report of the State Mineralogist. The value of this report was so apparent that in 1889 the Legislature granted the Mining Bureau an appropriation of \$100,000, 75% to be spent in geological work in the field.

A staff of field assistants was formed and the ninth annual report, consisting principally of special articles, was published.

In 1890 work was vigorously prosecuted. A preliminary mineralogical and geological map of the State of California was drafted. This map was compiled from the most trustworthy data available, supplemented by the investigations of the field assistants of the Mining Bureau. It is not to be supposed that such a map could be absolutely correct. Every one conversant with the subject knows that a mineralogical and geological map of California, correct in all its details, could only be produced by persistent work of a strong corps of field men for many generations. All that was claimed for the map by the Mining Bureau was, that it graphically demonstrated the leading facts pertaining to the mineralogy and geology of California, as far as they were known at the time the map was compiled. There has been a constant demand for this map.

The tenth report contained several valuable special articles and an excellent paper on the geology of the mother lode by H. W. Fairbanks.

In 1891 the Mining Bureau received an appropriation of \$50,000, 60% to be expended for geological field work and scientific research. At that time it was decided that owing to the delay incidental to preparing an annual report, that the report of the State Mineralogist should be biennial.

In 1892 the eleventh report of the State Mineralogist was prepared. This handled the State by counties and contained valuable special articles. This report was shelved at Sacramento until the Legislature met in 1893, when it was published.

In 1893 Mr. Ireland was succeeded by J. J. Crawford as Mineralogist.

In 1893 a new Act was passed by the Legislature for the establishment, maintenance and support of the Mining Bureau.

In 1894 the twelfth report of the State Mineralogist was published.

In 1895 the Mining Bureau received an appropriation of \$50,000, 60% to be expended in geological field work and scientific research.

In 1896 the thirteenth report of the State Mineralogist was published. The twelfth and thirteenth reports are the best issued by the department.

In 1897 the Mining Bureau received an appropriation of \$50,000, at least 60% to be expended for field work and scientific research.

In 1894 Bulletin No. 2, "Methods of Mine Timbering," by W. H. Storms, was published. The first edition of this bulletin becoming exhausted a second was published.

Bulletin No. 3, "Gas and Petroleum Yielding Formations of the Great Central Valley of California," by W. L. Watts. Bulletin No. 4, "Catalogue of California Fossils," by Dr. T. G. Cooper. Bulletin No. 5, "The Cyanide Process," by Dr. A. Scheidel. In 1895, Bulletin No. 6, "California Gold Mill Practices," by E. B. Preston. Bulletin No. 7, "California Mineral Production for 1894," statistics by Chas. G. Yale. In 1896, Bulletin No. 8, "California Mineral Products for 1895," statistics by Chas. G. Yale. Bulletin No. 9, "Mine Drainage, Pumps, Etc.," by H. C. Behr. Bulletin No. 10, "A Biography Relating to the Geology, Paleontology and Mineral Resources of California," by Capt. A. W. Vogdes. Bulletin No. 11, "Oil and Gas Yielding Formations of Southern California, Part I," by W. L. Watts.

In 1897 the Mining Bureau received an appropriation of \$50,000, at least 50% to be expended for field work and scientific research.

In 1897 J. J. Crawford was succeeded by A. S. Cooper as State Mineralogist. In 1897, Bulletin No. 12, "California Mineral Production for 1896," statistics by Chas. G. Yale, was published.

Between March, 1897, and July, 1899, work on the oil yielding formations of southern California and collecting statistics, by W. L. Watts, and on the Randsburg district in Kern county, by J. H. Means, was done.

In 1899 were published Bulletin No. 13, a statistical sheet for 1897, by Chas. G. Yale; also Bulletin No. 15, a contour map of Oil City, Fresno county, by J. H. Means; also Bulletin No. 16, entitled "Genesis of Petroleum in California," by A. S. Cooper.

In 1899 the Mining Bureau received an appropriation of \$50,000, \$20,000 to be expended in making a practical and scientific examination of the mother lode and other mineral districts of California, including the oil districts, and preparing a brief and accurate history of such districts, and the development, product, researches, methods of working, and future possibilities of the mining and oil industries of California, such examinations to be made by competent experts, experienced in California mining, and assistants, all of whom shall be appointed and have their compensation fixed by the Governor in accordance with the tenor of this enactment.

Governor Gage conferred with A. S. Cooper, the State Mineralogist, and the trustees of the Mining Bureau. The State Mineralogist refused to participate in, or to have anything to do with work outlined in the enactment cited, unless he had the appointing of the assistants who were to do the work.

Governor Gage appointed W. L. Watts as State expert in California mining to take charge of the work, and other assistants who were assigned to special details.

During part of 1899 and in 1900 field work was actively prosecuted and the following bulletins issued by the California State Mining Bureau under the direction of Governor Gage: Bulletin No. 18, by W. H. Storms, "The Mother Lode Region of California"; Bulletin No. 19, by W. L. Watts, "The Oil and Gas Yielding Formations of California"; Bulletin No. 20, by W. L. Watts, "Synopsis of General Report of the California State Mining Bureau." The last mentioned bulletin was issued because the general report of the Mining Bureau, which sets forth in detail the condition of the mining and mineral industries in California, could not be printed owing to lack of funds. In 1900 a second edition of Bulletin No. 16 was published; also Bulletin No. 17, statistical sheet of 1899, by Chas. G. Yale; also registers of mines and minerals of Siskiyou, Calaveras and Trinity counties by State Mineralogist A. S. Cooper.

In 1901 Lewis E. Aubury, the present incumbent, was appointed State Mineralogist.

THE MUSEUM.—The Museum is a very important feature of the Mining Bureau. From the establishment of the department the museum was for many years under the charge of H. S. Durden. In this museum are minerals largely from California, but including specimens from all over the world.

Besides the minerals there are models of mines, showing methods of mine timbering and appliances used in mines and in the treatment of ores. There are also views and diagrams of mines, mills, machinery and oil fields, together with maps of mineral bearing regions. The museum of the Mining Bureau is visited by miners, prospectors, students, capitalists and others who are interested in geology and mining.

THE LABORATORY.—In the laboratory of the State Mining Bureau mineral specimens from California are submitted to a qualitative determination free of charge, and to facilitate this work the Wells-Fargo

Co. have authorized their agents to frank all specimens of less than twenty pounds in weight sent to the Mining Bureau from any railroad station in California.

LIBRARY.—The library of the Mining Bureau is open to the public and is furnished with books of reference and reports relating to mining and metallurgy. It also serves as a public office for the State Mineralogist.

The Fluor Spar and Zinc Mines of Kentucky and Illinois.*

Written for the MINING AND SCIENTIFIC PRESS by
F. H. HARWOOD.

Only a few years have passed since the western Kentucky and southern Illinois fluor spar district was first heard of, and only a short time since it has come into prominence as a great producer of fluor spar.

Practically all of the fluor spar mined in the United States in paying quantities comes from Crittenden, Livingston and Caldwell counties, Kentucky, and Hardin and Pope counties, Illinois. [Another important locality producing fluorite is Castle Dome, Yuma county, Arizona, where it is associated with lead ores. It is mined and shipped to California, where it is used in the manufacture of Portland cement.—Ed.]

The western Kentucky district comprises the counties of Crittenden, Livingston and Caldwell, and is reached from the north by the Illinois Central Railroad, and from the south by the way of Princeton, Ky. Entering this district from the south, at Mexico and Crayneville, small stations a few miles south of Marion, are seen great piles of the dazzling white mineral, with a mixture of green, yellow, blue or red, more rarely gray or even black fluor, these different shades of color frequently appearing in the same specimen.

A few miles farther north, at Marion, to the right of the railroad, will be seen the well-equipped concentrating mill of the Kentucky Fluor Spar Co., where the lead and fluor spar are separated. This plant has fifty tons daily capacity. The property of the company includes a grinding plant, where the fluor spar is ground and barreled for the use of glass factories, the production of hydrofluoric acid and the increasing demand of blast furnaces.

To the north of this plant are the works of the Lucile M. Co. Here fluor spar is being mined from a 140-foot shaft. At this depth there is a solid vein of fluor 14 feet wide.

At Marion, Crayneville and Mexico it is common to see dozens of wagons unloading into cars hundreds of tons of fluor spar and carbonate of zinc.

MARION, KENTUCKY.—The city of Marion has a population of 2500 and is a prosperous town, with substantial mercantile houses, large tobacco houses, a flouring mill and fluor spar works.

With the exception of the mine owned by the Lucile M. Co., the fluor spar properties are located south, west and north of Marion, within a few hours' drive.

The Columbia mine is 5 miles west of Marion, about 1 mile from Crittenden Springs. This property was worked for lead twenty-five years ago. At that time the lead was separated from the other minerals by a plant consisting of crusher, rolls and jigs, and for many years it was a large producer of lead ore. The large quantity of fluor spar in the ore was considered worthless and thrown aside. The discovery of lead in Colorado depreciated the value of pig lead to such an extent that the mine was abandoned, and the property has lately passed into the hands of another company. The old shafts are being reopened, new ones sunk and modern mining machinery erected. Within a short time this property will be a producer of both lead and fluor spar.

THE MEMPHIS MINE.—The Memphis mine, owned by the Kentucky Fluor Spar Co., produces thousands of tons of almost pure fluor spar. The mine is 5 miles west of Marion. The spar from this mine passes through the concentrating plant at Marion, where it is ground and shipped to the glass works and to manufacturers of hydrofluoric acid. The engravings on page 81 are views of the mines and works of this district.

The Yandell mine, 3 miles west of Mexico, is one of the largest producers of fluor spar in the western Kentucky district. The entire surface of this property is covered with fluor spar. The workings extend over a length of 1000 feet. Three shafts, each 100 feet deep, have been sunk. The mineral from this mine is hauled to Mexico, the nearest railroad point. The property is owned by the Kentucky Fluor Spar Co.

The Hodge mine, owned by the same company, is a few miles west of Crayneville. A vein of fluor spar 20 feet wide is developed at the 100-foot level. Steam hoists, washers and other necessary machinery are in use at this mine.

The Marble mine is 3 miles east of Crider, Caldwell county, Kentucky. It is owned and operated by the National Lead, Zinc & Fluor Spar Co. of Cleveland, Ohio. They recently completed a concentrating

*See illustrations on front page.

plant that will treat 100 tons of ore daily. Mining is carried on from two shafts, each 100 feet in depth. The ore carries galena, zinc blende and fluor spar.

The Bonanza mine is 1 mile from the town of Lola and 5 miles from Salem. It is one of the best equipped properties in the district. It has electric lights, air drills and all the essentials of a modern mining plant. It is owned and operated by the American Lead, Zinc & Fluor Spar Co. of Cleveland, Ohio. The capacity of this mine is 100 tons of fluor spar per day.

There are numerous other mines in this district in operation, producing large quantities of fluor spar, among them the Tabb, Nancy Hanks, Holly, Larue, Tabor, Asbridge and Evening Star. New properties are being opened over the entire district, and from indications there is a large supply of fluor spar, lead and zinc available.

Salem, Livingston county, Kentucky, in the heart of the western Kentucky fields, 12 miles west of Marion, is a village of several hundred people and is surrounded by fertile farms. The noted mines are the Cullen and Morning Star.

The Cullen mine, near Salem, belongs to the Eagle Fluor Spar Co. of Wheeling, West Virginia. It is the best known property in Livingston county. The vein at the Cullen mine carries three marketable minerals—galena, zinc blende and fluor spar. The zinc ore and fluor spar being of nearly the same specific gravity, the problem of separation has been undertaken by D. Garth Hearne, president of the company, assisted by Thomas H. B. Haase, general manager. The latest improved separating machinery has been placed at the mine and experiments are now being made. If successful, it will result in the western Kentucky field making a large output of zinc blende.

(TO BE CONTINUED.)

Topographic Maps and Geologic Folios of California.

The United States Geological Survey has been engaged since its organization in making a topographic survey and map and in the preparation of a geologic map of the United States. Under the plan adopted, the unit of survey is a quadrangle 15', 30', or 1° in extent each way, covering an area of one-sixteenth, one-fourth, or one "square degree." The unit of publication is an atlas sheet 16½ inches wide by 20 inches high, and each sheet is a topographic map of one of the above areas. As the atlas sheets are uniform in size, the greater the area covered the smaller the scale of the map. The scale of the full degree sheet is 1:250,000, that of the 30' sheet is 1:125,000, and that of the 15' sheet is 1:62,500. The sheet is designated by the name of some well-known place or feature appearing on it, and the names of adjoining published sheets are printed on the margin. The maps are engraved on copper and printed from stone, in three colors. The cultural features, such as roads, railroads, cities, towns, etc., as well as all lettering, are in black; all water features are printed in blue, and the hill features are shown by brown contour lines. The contour interval varies with the scale of the map and the relief of the country. Maps of limited areas economically important are sometimes published which are not in conformity with the general scheme outlined above; these are called special maps.

The progress of this work in California is shown on the index map. Each of the rectangles outlined shows the location and area of a quadrangle of which a topographic survey has been made. The name of the resulting atlas sheet, when published, is also shown, and its scale is indicated by the size of the rectangles; thus it appears that all three scales are used and that the larger rectangles indicate the smaller-scale sheets and the smaller rectangles indicate the larger-scale sheets. Each of the atlas sheets represented by the largest rectangles shows a tract (quadrangle) 1° in extent each way (one "square degree"), or about 3600 square miles, the area varying with the latitude. The scale is 1:250,000, or about 4 miles to 1 inch. The contour interval varies with the relief of the country; on most of these sheets it is 200 feet, on some it is 250 feet and on two 100 feet. Each of the sheets represented by the rectangles intermediate in size shows a quadrangle 30' in extent each way (one-fourth of a "square degree"), or about 920 square miles. The scale is 1:125,000, or about 2 miles to 1 inch, and the contour interval is 100 feet. The smallest rectangles represent atlas sheets each of which shows a quadrangle 15', or about 240 square miles. The scale is 1:62,500, or about 1 mile to 1 inch, and the contour interval is 25 to 50 feet. Smaller rectangles within the larger ones indicate that sheets on both scales have been published for such areas. The whole number of atlas sheets published for California is seventy-five.

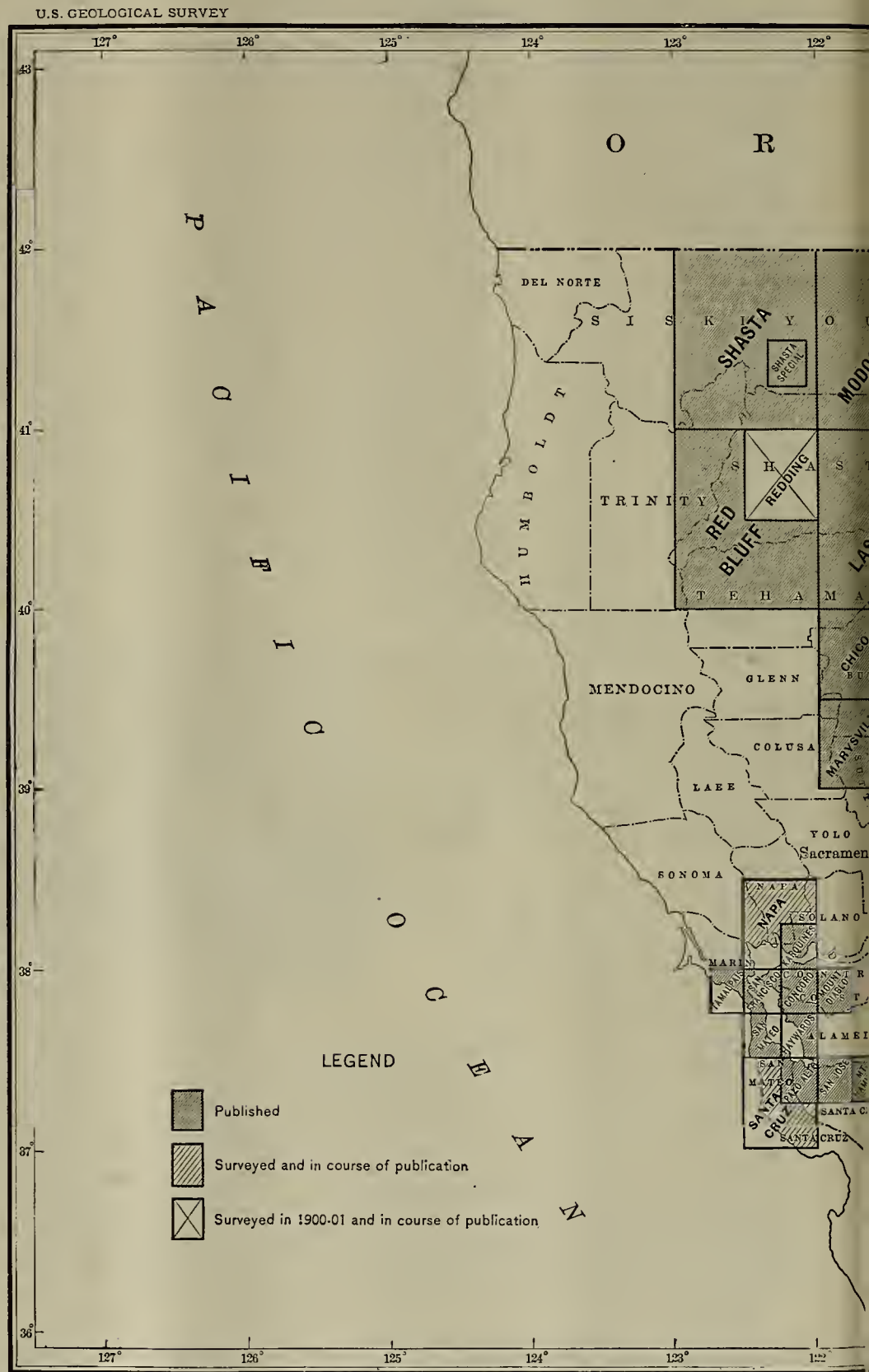
Geologic maps corresponding in position, area and name to the topographic maps are being published in the form of folios. The areal geology, underground structure and mineral deposits are represented by colors and patterns. Each folio contains topographic,

geologic, economic and structural maps of the quadrangle, and occasionally other illustrations, together with a general description. The following folios—to be applied for by name and annexed number—representing quadrangles of this region, have been issued: Placerville, 3; Sacramento, 5; Jackson, 11; Lassen Peak, 15; Marysville, 17; Smartsville, 18; Nevada City Special, 29; Pyramid Peak, 31; Downieville, 37; Truckee, 39; Sonora, 41; Bidwell Bar, 43; Big Trees, 51; Mother Lode District, 63; Colfax, 66.

Under the existing law, the maps and folios are disposed of by sale at practically the cost of paper

rather than return very small amounts of money by mail, unless directions to the contrary are given in the order. The usual price of the geologic folios is 25 cents each. The name of the county should be included in the postoffice address. Prepayment is required, and may be made by money order payable to the order of the Director of the United States Geological Survey, or in cash—the exact amount. Checks and postage stamps can not be accepted.

The readers of this journal do not need any discussion of the value to the civil engineer, the mining engineer, the railroad contractor and the prospector



MAP OF NORTHERN CALIFORNIA, SHOWING

and printing. Index maps of the topographic work in different sections of the country and a general circular upon geologic folios may be had upon application to the Director of the United States Geological Survey, Washington, D. C., who will gladly give further information on the subject.

The topographic maps are sold at the rate of 5 cents a sheet of standard size, or for 100 or more in one order, whether of the same sheet or of different sheets, the price is 2 cents a sheet for the standard size. When maps ordered are not in stock, the right is reserved by the Survey to substitute other sheets,

of these maps and folios. They have already saved to individuals and to corporations thousands of dollars that must otherwise have been expended.

INEXPERIENCED workmen do not usually make good solder. The materials necessary are equal parts of pure block tin and lead, cut into pieces weighing one pound each. Melt, stir and run off into a mould. Solder may be tested by holding a bar near the ear and bending it. If it gives forth a crackling sound (the cry of tin) it is good; if not, reject it, as it has too much lead and too little tin.

American Methods in Manufacturing.

At Claridge's Hotel in London, England, on the night of January 9th, George Westinghouse entertained at dinner a large company of British railway managers, financiers and scientists. Replying to a speech by Lord Kelvin, Mr. Westinghouse said:

"I wish to thank our distinguished scientific friend Lord Kelvin for the complimentary language he has used about me, and I would like to say to all you

resulted from ordinary commercial motives.

"I came here thirty years ago, and for ten years or so I was here about half the time. At that time it was very difficult to get any new thing done in England. I wanted in those early days to try an iron brake shoe, because, on account of rapid wear, we couldn't keep the wooden one adjusted. I had to beg and beg to be permitted to put a set of metal brake shoes on one tender on the Caledonian railway. Finally I succeeded. You all know that nowadays all the railway shoes or blocks are made of cast iron or other metal and are used upon all the wheels of

that among the references cited many are of English origin, some of them containing ideas so complete that the wonder is the inventions disclosed were not established fully and completely in your own land. These records seem to show that Americans and Englishmen have invented the same thing many times.

"In America, however, we have always been short-handed with regard to labor. We have been obliged to find methods whereby one man may accomplish the work of two or three men as compared with your practice here. We have had the best men from Europe—Englishmen, Germans, French, everybody—skilled men, highly trained men, as well as laboring men; we have combined their experience with our own, coupled it with our necessities, and have thus accomplished results unattainable in a country like this where you have more labor than you can well keep employed.

"As an illustration of what has been accomplished by the use of electricity in a great industry, I may cite the Homestead Mills of the Carnegie Company. Mr. Schwab is a genius in his way, particularly in the management of men; he is a master in organizing and directing men. Mr. Carnegie believed in him; and if Mr. Schwab made a suggestion in regard to the use of new appliances, even if it involved the tearing down of an old mill and putting up a new one, the new one was ordered. What Mr. Schwab thought should be done was done. As a result of such progressiveness, we may see the splendid mills at Homestead, where they produce three times as much steel with about 4000 men as the Krupp Works produce with 15,000 men. The results are simply wonderful. You can start there to-day in a building containing steel-melting furnaces, and you will there see three men mounted on a car with the charging apparatus which is moved and operated by electricity. With a few movements of this ingenious contrivance three men charge twenty furnaces, which, prior to the use of electricity, would have required the labor of over 200 men.

"You may go into the yard of the Homestead Mills where they pile the metal in stock. This yard is covered by a system of overhead cranes, and the result is that not only here, but in the mill and in every other place, you may see great weights lifted and many undertakings going on without a single man exerting himself a bit—working not half as hard as I am working now.

"I took some English friends to Homestead. Mr. Schwab, after guiding us through several departments, said: 'I will now show you where we turn out 750 tons of plate girders per day.' The mill was in the shape of an 'L.' We went into the short end of the 'L' where the furnaces were fed by natural gas, of course requiring no stokers. The end at which we entered had a rather low roof, and there was in sight a contrivance like a hattering ram in front of the furnaces. Two workmen were sitting down eating their dinners near by; no one else was present. I thought, 'Mr. Schwab has made a mistake, he has asked us to see a mill that is not in operation.' But we went through the mill, which was about 200 feet long, and suddenly we heard a rattle and then saw a truck approaching loaded with a big ingot. No one touched the truck or the ingot. The load came to a platform, the crane overhead dropped a pair of tongs and quickly put the ingot on the roller table, and, as it moved along to the great rolls, it was automatically kept in place. The adjusting screws of the rolls were turned by little electric motors, and not a man in that house did a bit of work. It was just as easy as what you are doing now—looking on. We went back to the furnaces. There was a fifteen-year-old boy seated in a little place called the 'pulpit.' He was able, merely by the movement of levers, to open at will any of the furnace doors and move the car along. We saw this car come in front of a furnace and the charging machine approach and take out of the open furnace a hot ingot which was dropped on the car and moved off to its work. There was this boy doing absolutely no hard work, and this mill was turning out 750 tons of steel plate each day. My English friends said, 'England has no chance in competition with such methods.'

"Now all this sort of thing came about in America because of our necessities. We had not men enough to do our work. There was a premium in favor of those who could invent machines to work and thus supply the deficiency.

"At the Carnegie Mills we went to see three blast furnaces. They were making 1800 tons of pig iron in twenty-four hours. We saw only two or three men on a truck which was moved automatically. These men were letting the ore run from shoots and mixing it in the required quantity; and when they had filled a truck, it was carried up and its contents dumped into a furnace, whence it returned for another load. They were running the metal into an immense receptacle into which the metal from all three furnaces was mixed. From this place the metal was taken as required, put into a special tank, mounted on a car and taken to Homestead, 2 or 3 miles away, to be poured into the furnace; one heating only was required."

An experimental attempt is being made to convert the tremendous power of moving glaciers in the Swiss Alps to commercial uses.

TWENTY-SECOND ANNUAL REPORT, PART I PL XXII



PROGRESS OF TOPOGRAPHIC SURVEYING.

railway men here present that my life has been very much associated with your calling. I invented the brake, of which Lord Kelvin has spoken, when I was scarcely twenty-one years old, and thus became acquainted with railway men when the railway industry was rather a poor one compared with what it is today. Since then I have closely followed railway operations, becoming acquainted with almost everything that is being done in them, and it is particularly my friendship with railway men which has prompted me to go forward in my work with an interest and keenness that probably would not have

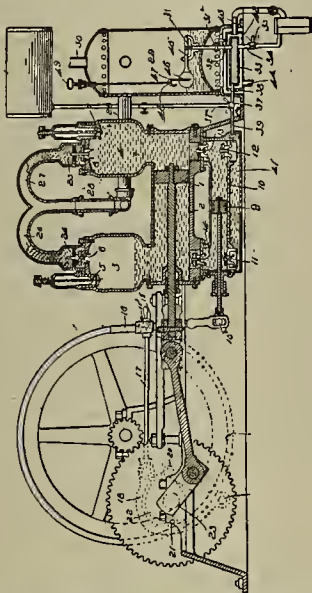
the train. Lord Kelvin has alluded to 'American methods.' May I say that one of your English difficulties is inherent, I think, in an old-world highly developed country. After a man (or a nation) has worked prosperously for a long time, he opposes improvement or suggestion, thinking, 'What I have is good enough; I won't try a new thing.' In America, however, the necessities have produced different results. Lord Kelvin speaks of England having sent many men to America. It has also sent to us many ideas. If you take up the American patent records, and follow the cases in litigation especially, you will find

Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 27, 1903.

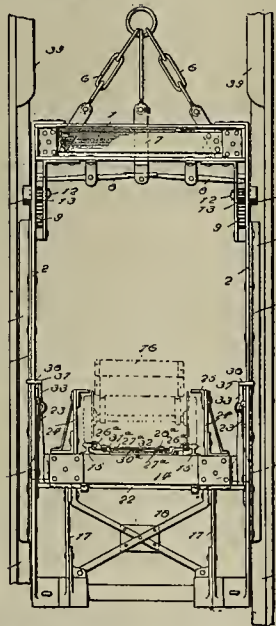
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

AIR COMPRESSOR.—No. 719,127; W. M. Myers, St. Joseph, Mo.



In an air compressor, combination with two vertically arranged compression chambers in which liquid is adapted to be reciprocated, horizontal chamber in communication with chambers, horizontal reciprocating piston in chamber, smaller horizontal chamber below chamber and in communication therewith to supply liquid to compression chamber, piston mounted to reciprocate in smaller horizontal chamber to force liquid into pump chamber; an adjustable reciprocating lever connected with last-mentioned piston, rod operated by eccentric adjustably connected with lever to limit throw of piston, motive power for operating lever and horizontal reciprocating piston, of tank to receive compressed air and means to cool liquid before it is supplied to small horizontal chamber.

SELF DUMPING COAL ELEVATOR.—No. 719,009; D. W. Jones, Luhrig, Ohio.



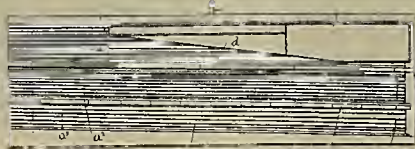
In hoisting apparatus and in combination with suspending frame and tilting platform, vertically disposed catches pivoted to uprights and interlocked at lower ends with platform and uprights to hold platform in horizontal position, and trips extended within path of upper ends of catches to effect disengagement of lower ends from platform.

PROCESS OF TREATING COPPER ORES.—No. 719,132; W. Payne, J. H. Gillies and A. Gondolf, Orange, New South Wales, Australia.

Process of treating copper ores, consisting in first reducing ore to suitable fineness, then roasting it to oxide, saturating with solution of ferrous sulphate or sulphate and chloride, roasting again and adding iron sulphide or sulphur proportionate to cop-

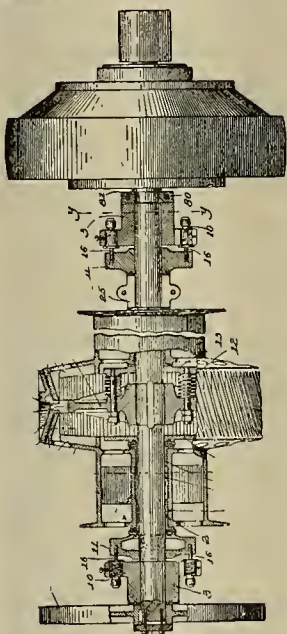
per present, leaching hot ore in water and finally precipitating copper.

ORE CONCENTRATOR.—No. 718,970; F. L. Bartlett, Denver, Colo.



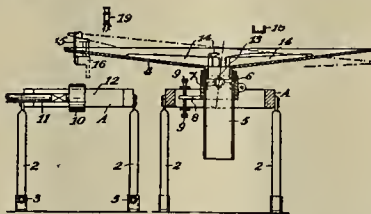
An ore concentrator consisting of laterally inclined shaking table having feed box extending along upper edge and feed water supply pipe extending along upper edge below feed box and having longitudinal riffling which gradually and slowly decrease in height from upper end to lower end of feed box and taper abruptly to lower end of table.

HOISTING APPARATUS.—No. 719,033; A. E. Norris, Cambridge, Mass.



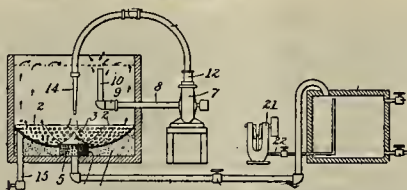
In hoisting apparatus, main shaft, clutch member fixed thereon, friction drum loose thereon and constituting movable clutch member, fixed abutment, thrust collar on shaft between friction drum and abutment, screw in abutment and outside of periphery of shaft, operating lever connected to screw, arc of movement of lever being limited, and means to adjust screw in abutment to compensate for wear, turning of screw operating to give thrust collar requisite longitudinal movement to cause engagement of clutch members.

ORE CONCENTRATOR.—No. 719,181; C. Brown, Bishop, Cal.



In ore concentrator, combination of endwise shaking frame having open center; circular table having central hollow shaft extending through open center of frame; ring having trunnions extending horizontally located at diametrically opposite points and journaled upon frame, ring receiving shaft and providing means for tilting table in plane at right angles to direction of oscillation of frame; arm projecting from ring at right angles to trunnions, and means engaging arm above and below and adjusting position of table; and means for giving table step-by-step rotation.

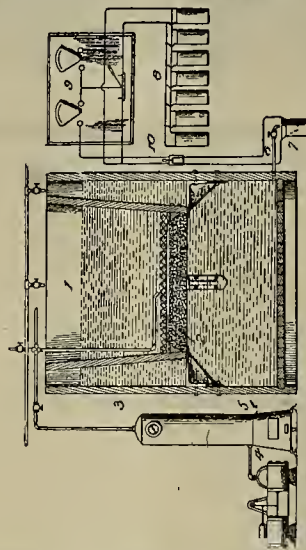
APPARATUS FOR TREATING ORES.—No. 719,273; Z. B. Stuart, Los Angeles, Cal.



Tank for holding mixture, means to mingle air with mixture in tank and agitate mixture, and adjustable means embracing suction pipe to draw mix-

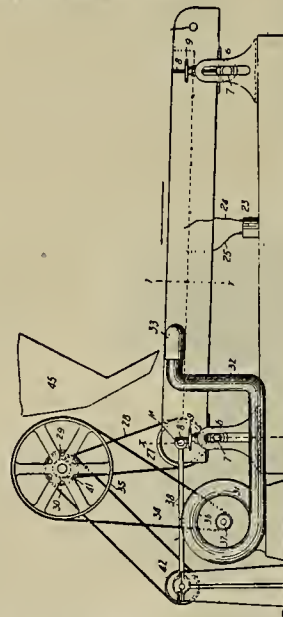
ture with additional amount of air through circulating and mixing mechanism and further agitate and mix same and return mixture to tank, and means for raising and lowering mouth of suction pipe.

PROCESS FOR TREATING ARGILLACEOUS AND ALKALINE ORES.—No. 719,207; C. H. Gage, Denver, Colo.



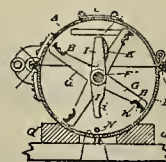
The process of reducing argillaceous and alkaline ores which consists in subjecting them to bath of hydrocyanic acid, agitating mixture, adding solution of potassium cyanide, further agitation and filtering mixture, and drawing off solution into bed of charcoal containing solution of iron sulphate, bed being within an electric circuit and subjected to electric current, thereby electrolytically depositing precious metals.

DRY ORE SEPARATOR.—No. 719,397; R. E. Waugh and E. Waugh, Denver, Colo.



In dry ore separator, combination with main frame, of apron frame mounted thereon and provided with air chamber, endless traveling apron mounted on apron frame and provided with electro-magnets located adjacent the inner surface of apron which is arranged to close air chamber, and means for introducing air under pressure to air chamber, apron fabric being such as to allow air from chamber to pass therethrough.

ORE AMALGAMATOR.—No. 719,161; J. E. Sutphen, Albany, N. Y.



In amalgamator, combination of stationary cylinder or shell having paddles arranged to revolve therein adapted to pass through mercury contained in lower part of cylinder or shell and carry it up to various points of discharge through material being treated, with arms swinging loosely from shaft through such cylinder or shell and carrying at upper end of such arms float and at lower end thereof silver plate adapted to prevent violent agitation, jar and concussion of material and mercury and for silver plates to come in contact with mercury.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The management of the Alaska Treadwell mine made the following return for December: 240-stamp mill ran 29½ days; the 30-stamp mill ran 5½ days; crushed 43,715 tons ore; estimated realizable value of bullion, \$45,025. Saved 825 tons sulphurets; estimated value, \$10,283. Working expenses for the month, \$64,288.

L. A. Minoque, returning to Dawson from the Chicken creek quartz strike, shows specimens of free milling gold ore, taken from the Matheson lodge on Shadler mountain. He says Tanana and Chicken creek are attracting many miners from Dawson.

J. Leitha, secretary the Holvelta G. M. & M. Co., which bought the Ben Johnson quartz group adjoining the Yellow Jacket on Wndham bay, near Juneau, has begun with twelve men on development. W. A. Heltmann of Seattle is president and general manager.

Letters from Dawson report a strike on the north fork of the Koyukuk river in American territory. Several paying streams have been found in the vicinity, tributary to Seattle river, which flows into the north fork of the Koyukuk. The best pans on the several new creeks average \$38 each. The biggest pay has been found on Masot creek from No. 1 above discovery. Peacher creek, a tributary of Mascot, and Blue Cloud, tributary to Seattle river, below the mouth of Mascot, and Conglomerate show good prospects. On Washington creek was made the first strike in the district—in August—10 cents to 25 cents to the pan being obtained. The strike on Mascot was made Sept. 19.

R. Henderson, one of the discoverers of the Klondike, has reached Dawson from 350 miles up Pelly river. He says winter prospecting shows the existence of gold in paying quantities in many places. Hundreds of streams are tributary to the main river and he predicts another district equal to Forty-mile will be located by spring. One strike has been made on Morgan creek, 10 miles above Hool canyon. Morgan there found gold in paying quantities and had not reached bedrock. He says prospectors along Pelly are scattered all the way from the mouth to 350 miles above—most of them trapping. Winter stampedes are in progress from Dawson to Duncan creek on the Stewart river, where miles of creek bottom are showing pay dirt. Others are hurrying to Tanana, 300 miles distant, from which couriers and letters have arrived describing rich diggings discovered. The stampedes have suffered from cold, with the thermometer at 65° below zero.

ARIZONA.

COCHISE COUNTY.

Manager Briggs, at the Modern mine near Bisbee, is unwatering the shaft, using a bailing skip.

At the Copper Glance M. Co. group near Bisbee, work had to be discontinued in the two-compartment shaft last week on account of water, but the company will install a station pump, a sinking pump, and two 150 H. P. boilers. They will cut a station at the 500 level, and sinking will be resumed to 1000 feet.

At the Silver Throat hoist at Tombstone operations are resumed. It is the intention of the company to sink the shaft to a depth of 1000 feet. Pumps will be put in.

The two-compartment shaft of the Bisbee & Marquette Co., near Bisbee, is down 50 feet, says Superintendent J. Blair.

Superintendent Barker, the Arizona G. M. & D. Co., operating a group of 240 acres, northwest of the Copper Queen mine, near Bisbee, says the tunnel has opened up ore showing values in gold and silver.

Superintendent S. Turner, Calumet & Bisbee Co., near Bisbee, has three shifts at work sinking the two-compartment shaft and expects to cut the main ore body at 1400 feet. This shaft is 300 feet from the South Bisbee No. 3, which is down 1000 feet and in ore.

M. J. Mitchell of Ramsey canyon, operating in the Huachuca mountains, with A. Campbell and W. J. Burner, has a tunnel in 100 feet, which will be driven 3000 feet.

GILA COUNTY.

Reports from the Old Dominion at Globe say freight rates to New York on matte have been reduced to \$11 39 a ton, and they are paying \$11 76 a ton for coke, as against \$19 before the recent shutdown and general readjustment of affairs. The matte and flue dust is being worked up to

provide money for improvements and additions to the plant, including the building of a converter.

At the Untold Globe mines at Globe the Gray shaft has been unwatered and work resumed in the lower levels.

GRAHAM COUNTY.

The Coronado or McLean group of mines at Clifton have been sold for \$100,000 to an Arizona company with W. B. Thompson, manager.

MARICOPA COUNTY.

L. R. Ligler, C. McEwen and C. Lauver have organized the Arizona Granite Co., and will work their quarries 6 miles south of Phoenix, on the north side of the Salt River mountains.

The Oro Grande M. Co., near Wickenburg, will put in a 40 H. P. hoist.—G. Fowler has taken an option on five of the Case-Kent claims, near the Oro Grande.

MOHAVE COUNTY.

It is reported that the C. O. D. Con. Co. at Stockton Bill, 14 miles north of Kingman, will resume. The drift from the 300 level is in 1000 feet. The raise to the surface will be double compartment and used for the main working shaft.

In crosscutting for the ledge at the Lucky Boy mine, at Chloride, on the 500 level, a parallel vein of rich brown iron ore was cut. It is 10 inches thick, found below water level and the gold is free.

The Queen Bee mine at Chloride is putting in a gasoline hoist.

A 50 H. P. dynamo has been installed at the Minnesota-Connor mine at Chloride.

SANTA CRUZ COUNTY.

The Onelda Con. G. & C. Co., operating on the west side of the Patagonia mountains, 12 miles from Nogales, have an inclined shaft on their Arizona claim 80 feet deep, in ore, and a tunnel in 260 feet is expected to cut the ledge 200 feet lower than the bottom of the incline. A 20-ton concentrating mill is contemplated. D. A. Richardson is president.

YAVAPAI COUNTY.

It is reported that W. A. Clark proposes increasing the capacity of the United Verde plant. The six furnaces, with a capacity of 1500 tons of ore daily, will be replaced by five 500-ton furnaces. It is understood that two of the replaced furnaces will be moved 5 miles to the Iron King mine, a copper holding which Clark is developing.

A strike of gold ore is reported in the Catoclin mine, 8½ miles southwest of Prescott. This has always been considered a silver mine. H. Blauvelt is superintendent.

H. Legge, superintendent the White Horse group of mines, 8 miles east of Prescott, reports a strike of oxidized ore at a depth of 65 feet, assaying \$80.

CALIFORNIA.

AMADOR COUNTY.

T. Boyson, owning 600 acres of land in Plymouth district, reports having struck a shoot of gold quartz on his holdings, between Plymouth and the Bay State mine, last week. There are good values in the veins on this property at several points where development has been done.

G. Courtright has three men sinking a shaft on the Spring Hill mine on Jackson creek, near Jackson.

Near Iono, the Tonzi Bros. are putting in an 18 H. P. engine on their mine in Mount Echo district to run the mill.

C. C. Ranlett & Co. are cutting a tunnel into their shaft on the Spring Guich quartz claim, near Electra. Ten tons of the ore recently milled \$7 a ton free gold, says Ranlett.

It is reported that P. Elcheroth of the Sand Pile mine will erect a cyanide plant of 300 tons daily capacity near Forest Home to treat tailings from the Plymouth Con. mines at Plymouth. These have lain there for nearly twenty years.

BUTTE COUNTY.

A club has been organized at Oroville by those interested in dredging. Among charter members are W. P. Hammond, A. F. Jones, C. Hellman, W. Sexton, F. Griffin, O. V. Perry, T. J. Barbour, J. W. Goodwin and H. H. Yard.

CALAVERAS COUNTY.

The Sheep Ranch mine hoist at Sheep Ranch was wrecked last week and work temporarily suspended. A nut from one of the boxes of the shaft fell into the cog gearing. Repairs are being made, but only one reel can be run till new castings are obtained.

The Calaveras Development Co. will begin operations on their hydraulic mines, near Railroad Flat, this month. A. L. Taylor of San Francisco, Cal., is president.

The Nelson mines, at Calaveritas, began hydraulic last week.

Superintendent A. C. Harmon of the Penn M. Co., at Campo Soco, says a hoist

will be put in at the mine capable of working to a depth of 2000 feet.

EL DORADO COUNTY.

At the Capitola mine, 1½ mile north of El Dorado, being operated by G. H. Dithman, G. F. Lewis and W. R. Tong, they have a party shaft down 35 feet, where the quartz assays \$8.

KERN COUNTY.

(Special Correspondence).—The Standard D. M. & M. Co. of Los Angeles has completed the assessment work on their property near Randsburg. Five claims are included in the group. Randsburg, Feb. 1.

The Potomac Oil Co. has contracted its oil to the Southwestern Refining Co., which is building a plant near the Standard Oil Co.'s tanks in Kern River field, near Bakersfield. The Potomac is preparing to drill two more wells, as is also the Columbian and the Continental.

The Four Oil Co., near Bakersfield, has begun drilling, and the Black Jack on the same section and the Alma and Alma, Jr., will begin next week.

The San Diego and Rustler claims, near Randsburg, are reported sold to A. C. Burcham of Los Angeles for \$60,000. These claims adjoin the Yellow Aster mines on the west.

The Keno and Faro mines, near Randsburg, have been sold to A. L. Morris of Los Angeles for \$60,000. There is a shaft on one of them 120 feet deep.

LOS ANGELES COUNTY.

(Special Correspondence).—San Gabriel canyon mines are being operated by a number of companies. One of the latest to secure holdings in that vicinity is the Standard D. M. & M. Co. of Los Angeles. Work has been done in developing the property. Azusa, Feb. 1.

NEVADA COUNTY.

The Peabody mine at Gold Hill, near Grass Valley, has been sold to a company of Puget Sound men for \$125,000. Work will begin this month.

Grading has begun at the North Star mine's power house for a 300 H. P. air compressor. This will be utilized in conjunction with the plant now in operation, says Superintendent A. D. Foote.

PLACER COUNTY.

The offices of the Hidden Treasure M. Co., near Michigan Bluff, have been removed from Sunny South to Centerville, at the mouth of the main tunnel, which is in 5 miles under Forest Hill divide.

The Hings Hill mine at Iowa Hill resumed last week.

At the Bonnie Boe mine at Dutch Flat the 5-stamp mill is in operation.

SACRAMENTO COUNTY.

It is estimated that there are 300 men engaged in placer mining in the district around Folsom. The Gray Wing has 81 men at work, the Red Canyon 40, in its shafts and tunnels, and the El Dorado Con. 75. J. H. Roberts of Sacramento has 20 men developing ground near the Gray Wing and has put in hoisting works. On the Fassler ranch J. Woods has men at work prospecting with a drilling machine. The Blue Ravine Co. is operating on the Murray ranch. The Sutter M. Co. of Sacramento has a Keystone driller exploring their ground.

SAN BENITO COUNTY.

H. H. Bradford, one of the owners of the Cerro Bonito quicksilver mine, near Hollister, says they have men at work building ore furnaces, and will begin reorting by March 1.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Providence Mountain M. Co. of Los Angeles, owning property in the Providence mountains, report the Iron mine turning out well, the shaft being down 112 feet. The ore body, which was 8 feet wide on top, has swelled and the shaft at the bottom is all in ore of a better grade, being hematite, containing 60% iron, little sulphur and only a trace of phosphorus. No titanic acid has been found. There are twelve claims in the group. The company owns other groups in this vicinity, among them the Fair and Square gold and silver mines, which are being developed. The shaft is down 75 feet in 6 feet of ore which assays from \$9 to \$168 gold and silver. The country rock is porphyry and decomposed granite.

At the Golden Zone group the main ledge is 16 feet wide, giving returns of \$6 40 to \$11 per ton. Two hundred and seventy feet of work has been done on two of the claims.

The Wolframite group of three claims is also being worked. Wolframite was discovered at the surface, while at 50 feet in depth a 5-foot ledge of gold, silver and copper ore is found, the wolframite gradually going out of the vein.

The Desert country generally is looking

well and many large low-grade properties are being developed. The Ludlow mines, owned by Eastern people, known as the Bagdad M. Co., are being developed. These mines are 8 miles south of Ludlow, a station on the Santa Fe Railroad, and a branch line is being built to the property which is nearly completed. E. H. Stagg is manager and L. E. Porter superintendent. The 50-stamp mill erected for custom ores at Barstow is owned by this company and is run twelve hours per day on the best ores from these and other mines owned by the company. The J. R. Gentry group, near Ludlow, has been bought by the same syndicate and are giving employment to a number of men. This company, while being the same people, is called the Benj. E. Chase G. M. Co. They have a large body of low-grade ore and have eight claims in the group.

G. B. Mier and associates, who own the Lava Bed group of mines south of Lave, in the Lava Beds district, are putting up a mill. Over 1200 feet of development has been done on a ledge 20 to 30 feet in width carrying some lead, and will concentrate. A small vein of ore has been located that assays from \$25 to \$35 gold per ton.

J. B. Osborne is working seven men on the Osborne group, in Ord district, 14 miles south of Daggett. There are twenty-three claims, eight of them patented.

The Malachite C.-G. Co. of Los Angeles is developing property adjoining the Brilliant mine of the Osborne group, in Ord district. Men are developing the property.

A 10-foot lodge was recently struck by W. Bailey, 4 miles west of Ord mountain, showing free gold.

C. A. Burcham of Los Angeles is developing a large low-grade prospect adjoining the Waterloo mines in west Calico. Over 600 feet of tunneling has been done and streaks of high-grade ore found, the mineralized formation being 400 feet wide.

The St. Elmo mine, near Johannesburg, has been bonded by S. W. Dorsey of Los Angeles and Eastern associates. Work of clearing out the mine and opening up new ore bodies has commenced.

Gold Mountain mines, owned by J. R. DeLamar, have shut down for the winter. Forty men were employed under the management of Superintendent Doble.

The Black Hawk mines, 50 miles east of Victor, in the Black Hawk mining district, are reported sold and work about to commence.

Barstow, Feb. 2.

L. M. Gregory of Los Angeles, president of the Giant Ledge G. & C. Co., owning a group of nineteen claims on New York mountain, near Manvel, says they have a ledge 50 feet wide, carrying values in gold and copper. The ore is a concentrating and smelting proposition, and a plant will be installed to handle it.

J. Johnson is developing a gold and copper mine at Dale and reports four companies operating in the camp, 50 miles northeast of Walters station.

In the Gypsy mine of the Gordon group, near Death valley, last week G. Harvey, H. Phillips and G. Thomas, while re timbering the shaft, were buried by a cave-in and killed. The shaft timbers had been weakened by an explosion and were unable to withstand the strain when the wall began to sink.

SAN DIEGO COUNTY.

Superintendent Wauchope of the Noble mines, near Pine Valley, says he has twenty-five men at work, but will increase the number. These mines are southeast from Stonewall.

SANTA CLARA COUNTY.

(Special Correspondence).—The copper mine in the Hacienda canyon has been opened by Mr. Kitchen, a Swedish mechanical engineer of San Jose. There are some carbonates, but mostly native copper and red oxide, partly in serpentine, but mostly in altered greenstone. New Almaden, Jan. 29.

SEASTA COUNTY.

Thirty-five feet of the 112-foot tunnel in the Hawaii mine on Clear creek, near Redding, caved in during the storm last week. The Hawaii is one of the group being developed by the Connors G. M. Co. and the ore body shows gold and copper values.

Four hundred men are now enrolled by the Mountain Copper Co. at Keswick. Tuesday 100 new men applied for work. They comprised strikers, old employees and new men. The first furnace is now in operation. General Manager Wright states that in settlement of the strike the company made no concessions, and there will be no change in the policy of the company toward its employees, employing whom it likes and discharging whom it will. It admits of no dictation in the conducting of its business, and would, on the recurrence of the recent trouble, shut down its plant for an indefinite period.

A strike has been called at the Bully Choo quartz mine, 50 miles west of Red-

ding. Thirty-five men employed in the mine and mill quit on the 4th inst. because their demand for an eight-hour instead of a ten-hour day was not granted.

SIERRA COUNTY.

A Los Angeles company is reported to have bought Vineyard & Freeman's Cash in the Dump group of mines at Meadow Lake, near Sierra City. A 20-stamp mill will be erected in the spring.

SISKIYOU COUNTY.

It is reported that the Black Bear group of gold mines, near Black Bear, has been sold to the Illinois M. & R. Co., J. A. Shetty general manager, New York City, who will begin operations this month, and electric machinery will be installed.

SONOMA COUNTY.

The Banner gold mine, 4 miles south of Cloverdale, partially on the Italian-Swiss colony ground, will be operated. Coe, Hyatt, Whipple and the colony people are the owners.

TRINITY COUNTY.

Superintendent G. Lowden of the Three Peaks mine on Coffee creek, near Carrville, says a 4-foot ledge has been struck in one of the drifts and the 10-stamp mill will be in operation next week. It is the intention of the company to put in an additional ten stamps next summer.

A portion of the flume of the La Grange Hydraulic M. Co., near Weaverville, where it crosses Garden gulch, was torn out by a landslide last week. Foreman J. E. Shand has begun repairs.

The Harmon mine, on West Weaver creek, near Weaverville, owned by Meckel Bros., is working a 10-foot bank of gravel.

In the lower tunnel on the Bull of the Woods mine, near Weaverville, a 2-foot ledge of gold ore has been opened. The owners, Montgomery & Byers, have a 2-stamp mill on the property which they propose to enlarge.

The Three Sisters mine, near French Gulch, has been bonded to H. Franck and J. Blagrove.

C. W., J. P. and J. T. Booth are working their hydraulic claim on Oregon mountain, near the Sweepstake, near Weaverville. They have an 8-foot bank of gravel and are running four hours a day.

The Bob's Farm M. Co. has been incorporated at Sacramento and will operate the Bob's Farm group of mines in Rattlesnake district.

TUOLUMNE COUNTY.

At the Cosmopolite mine, near Groveland, under bond to J. M. Merrill, the vein has been struck in the crosscut at 240 feet from the shaft and 500 feet below the surface. Superintendent H. Argall says the ore shows sulphurets and free gold, and a stamp mill is proposed.

J. J. Scofield, W. T. Lewis and D. Newman have bonded the Mastodon mine on the mother lode, near Groveland, for two and a half years, for \$15,000.

The mill on the Spring Gulch mine, near Carters, resumed last week to make a test run on 100 tons of ore. The mine is under bond to a Denver company, with K. C. Parrish as superintendent. The shaft is down 500 feet and a drift is being run to tap the ore shoots opened in the upper levels. The same company has a bond on the New Era (the Hunter mine), also near Buchanan.

The Kodak mine, on the North Fork, near the Providence, near Carters, has been bonded to W. E. Perry of Boston, Mass.

H. J. Dykes is opening up the Punter mine, southwest of Sonora. The shaft is being unwatered and retimbered.

At the Mountain Belle mine, near Soulsbyville, under bond to W. Sharwood, they are crosscutting on the 100-foot level, with six men at work. A hoist is already on the Mountain Belle and a compressor will be added.

The storm of last week flooded the Two Brothers mine, near Groveland, and all work was stopped. Unwatering is under way, says Foreman Reid.

The Pine Nut mine on Turnback creek, near Carters, has been bonded to C. L. Lang of Sonora.

Superintendent F. Chappellett of the Mohican mine, near Groveland, says they are working on a 15-foot body of ore and intend to put in a hoist underground 500 feet from the mouth of No. 1 tunnel, through which ore will be sent to the mill.

An Idaho company has a bond on the Vivian and Kanig mines, near Parrott's Ferry, on the Stanislaus river, near Columbia, and are opening it by a tunnel.

At the Draper, near Soulsbyville, the shaft is down 600 feet and crosscutting for the pay shoot begun. Ore is being stopped from the upper levels.

The foundation for the 10-stamp mill at the Altadena, near Columbia, is in place, says Superintendent C. A. Holland. The

shaft is being unwatered and sinking will be resumed.

W. T. Carter of Carters has bought a one-third interest in the Old Croesus mine, near Carters.

J. M. Merrill of Alameda has bonded the Cosmopolite quartz mine near Groveland for \$10,000.

COLORADO.

BOULDER COUNTY.

The Great Western M., M. & S. Co. has been incorporated at Boulder to operate several properties at Magnolia, Crisman, Sugar Loaf and Springdale and to conduct a sampling and refining business. The company is operating in the Anna Clark lode at Magnolia and the Decatur tunnel at Crisman. R. E. Dunsmore, C. N. Page, W. Koehler, Jr., C. L. Lewis, A. M. Hunter and A. T. Geiger are the officers, with W. A. Brockway manager.

A. Matt made a 20-ton shipment to the sampling works last week from his lease on the Little Joe, near Wall Street.

The Nancy Co. has started a stope on the Gillard vein, 300 feet from the crosscut.

Four tons of smelting ore were shipped from the Last Chance Jan. 30.

The Wano mine, at Jamestown, under Superintendent A. H. Brown, is showing a 25-foot body of ore that runs \$25 per ton.

W. Brown of Boulder is unwatering the Invincible mine preparatory to development. Superintendent G. Brinker of the Wandering Jew is driving a raise from the tunnel through to the surface, when he will put on a gasoline hoist.

CLEAR CREEK COUNTY.

G. Woodring, manager of the Mary Ann mine, near Georgetown, says a contract has been let to drive 100 feet on the vein where 3 feet of quartz is showing. A water right has been bought to develop power for drills, and a mill later on.

O. Shepherd reports carbonate of copper in the Buckeye, near Georgetown, with 12 inches of lead ore on the wall. An 8-inch streak of gray copper has been found in the Comet averaging \$68 per ton, says Superintendent F. A. Maxwell.

Aldridge & Co. have opened a 6-inch streak of gray copper in their lease on the Kirtley, near Georgetown.

Schauers & Noone have a bond and lease on the Magnet-Sequel group and have men at work on the first and fourth levels.

Haggart & Riley, working on the Edgar lode, on Democrat mountain, near the Rogers and Providence mines, have struck 10 inches of sulphurets ore.

The Vidler tunnel at Argentine is in 300 feet and is 8x8 feet in the clear. It is to be 7000 feet long. Work continues by hand until the machinery is installed. R. C. Vidler is manager.

A. E. Reynolds, owning the mines on the west part of Red Elephant mountain, near Lawson, is installing machinery for development work.

R. Willis, of Colorado Springs, says he will install a mill on his East Red Elephant millsite, near Lawson.

CUSTER COUNTY.

The P. & O. mine at Querida is showing up tellurides in the ore shoot.

EL PASO COUNTY.

The Colorado-Philadelphia mill of the United States R. & R. Co., at Colorado City, is reported closed down indefinitely.

FREMONT COUNTY.

The shaft house on the Lone Tree mine, near Florence, is finished and sinking in the main shaft resumed. The El Motor and American Flag have resumed. The shaft of the El Motor is 150 feet deep. At the Hector, owned by Jennings Bros. of Cripple Creek, the machinery is in position, pumping has begun and the shaft is being timbered.

The Florence Portland Cement Co. has incorporated to work 440 acres 6 miles east of Florence and near their mill; J. Q. McDonald, J. W. Cline, E. H. Carpenter, J. E. Broadhead, W. C. Parker, J. D. Blunt, W. Kelso; 300 acres of the company's ground contain deposits of shale, limestone and clay. Two millsites have been surveyed. It is intended to install a plant of 1000 barrels daily capacity.

GILPIN COUNTY.

Manager O. B. Thompson, of the Boston & Denver Con. M. & M. Co., says the properties of the company near Blackhawk are to be reopened, and operations begun on a larger scale than before.

The Four Mile Gulch T. M. Co. is working both the Wheeler and Klondike tunnels, near Black Hawk, the former being run in from Silver gulch and the Klondike from Dory gulch, the object being to drive the tunnels till they meet, says Superintendent Brohl. Their ore carries silver, lead and gold values.

D. H. Allen has taken a lease from the

city of Black Hawk on the slag deposit on the site of the old smelter of the Boston & Colorado, and has men at work to take out the slag. It is estimated there are 3000 tons in the bed of North Clear creek, carrying values of \$5 per ton, wanted by the Denver smelters for fluxing.

A strike in the Old Town mine, in Russell gulch, has been made, says Manager Kimball, showing a body of copper ore in sinking the shaft at 850 feet. At 890 feet it shows 2 feet wide, running three ounces gold, sixteen ounces silver and 4% copper. It is the intention to sink the shaft to 1000 feet.

The Monarch tunnel, near Idaho Springs, has resumed crosscutting with machine drills. The company owns the Freeland group of mines and is driving the bore to reach that property a distance of 1 mile. The Topic Co. has completed sinking a winze from the tunnel level and has opened up a body of milling ore to a depth of 800 feet. Drifting has begun.

Sinking of the shaft of the Arizona mine, near Idaho Springs, is under way, says Manager Morgan, and opening up a body of sulphide ore, which will be followed for another 200 feet and drifts run on both sides to the east, connecting with Morning Star, recently bought by this company.

The Freedom mine on Winnebago hill, near Central City will be operated by the Colorado & Tellurium M. Co., under a three years' lease and option, with W. W. Emmett as superintendent. The main shaft is down 850 feet and machinery will be ordered.

The Kemp-Calhoun mine at the head of Leavenworth gulch, near Central City, Manhire Bros., lessees, have the shaft down 275 feet and drifts started from that point.

Wright, Lilly & Co., of Colorado Springs, have taken a lease and bond on the Golden Dollar mine, northwest of the Prompt Pay mine in Russell district. They have miners at work in the 125 east level, from which they are taking out smelting ores, showing copper, lead and gold values; also hoisting milling ores and have made a three-cord shipment. E. Williams is superintendent.

GUNNISON COUNTY.

Manager A. Lejune has men at work driving the Blistered Horn tunnel, near Tin Cup.

In the Goodhope mine at Vulcan is reported a 3-foot vein of ore associated with tellurides, on the 500-foot level.

HINSDALE COUNTY.

The Dwyre M. Co. has taken a bond and lease on the Inez and Hollister claims, which adjoin the Isold mine, near Lake City, for \$80,000.

The concentrating mill of the Red Rover M. Co., treating low-grade ores from the Lellie mine, near Lake City, is turning out five carloads of concentrates per week, says Manager Farrell.

LAKE COUNTY.

In the main west drift toward the Resurrection from the Diamond shaft in Big Evans gulch, near Leadville, at a depth of 1000 feet a body of lead carbonate has been found, says Superintendent Brooks.

J. McGoff & Co., at the Little Troy near Leadville, are working a body of low-grade gold, silver and lead ore. The Hudson and Belmont, adjoining claims, report the same kind of ore. H. Dyat has struck a body of lead ore in the Peerless Maud showing lead sulphate.

Manager J. Shinn, of the Stormy Petrel M. Co., has men doing development work on the Lizzie Lou mine, on Horseshoe mountain, near Leadville. The Gold Basin has decided to prospect in the lower quartzite and is drifting to locate the vein previously exposed.

Work has begun on the Black Prince mine, near Leadville, under lease to the La Belle M. Co., with T. Owens as manager.

It is reported work had to be abandoned on the O'Neil shaft, started on North Fryer hill, Leadville, to tap the Progressive ore chute, on account of the flow of surface water. It is proposed to start a new shaft higher up the hill.

Manager J. W. Deane, of the Valley M. & L. Co., has arranged with the railroad company to place a switch to the Valley mine and to the shaft on Little Ellen hill, near Leadville. The Valley shaft is being deepened.

M. P. Murray, manager of the Ball Mountain M. Co., has started a shaft on the north side of South Evans gulch, near Leadville, and is down 60 feet.

The A. Y. & Minnie mill at Leadville is treating 100 tons of zinc-lead ore per day.

LA PLATA COUNTY.

The Aurora G. M. M. & T. Co. has been incorporated under the laws of Wyoming, to operate in the Oro Fino district, 1 mile

north of the Durango Girl, near Durango. J. T. O'Hara, of Durango, is manager. The ore is said to carry telluride.

LARIMER COUNTY.

Putnam & Barnard, contractors on the Greyton mine, near Pearl, are sinking the shaft an additional 50 feet. The Greyton is in State Line camp, 4 miles north of Pearl, and adjoins the Bonbright property.

MINERAL COUNTY.

An air plant will be put in at the Monte Carlo Co.'s mine near Creede, consisting of a gasoline engine, fan and pipe, says Superintendent Z. Wilson, after which he will resume driving the tunnel.

OURAY COUNTY.

The Tempest and Micky Breen groups near Ouray are sold to Denver and Chicago men, who incorporated as the Tempest Apex M. Co., with F. McLaughlin of Denver, president, and F. M. Jackson, vice-president and manager. The Tempest is near the head of Poughkeepsie gulch. The Breen mill will be overhauled and additional machinery put in.

SAN MIGUEL COUNTY.

The Boston-Telluride M. Co. will build a concentrating plant on its millsite at Pandora, 2 miles above Telluride, and also a tramway from the mill to the Japan group of mines in Savage basin, a distance of 2 miles. The tunnel on the Japan is in 2100 feet, and is expected to strike the vein at 2700 feet, a depth of 850 feet from the surface, and 640 feet below the upper workings.

A strike of sulphide ore is reported made in the Silver Tip mine, owned by D. Martin of Ophir, and shipments of \$20 gold ore are being made. The mine is 1½ miles east of Ophir and the ore is from a depth of 150 feet in a 400 foot tunnel, with the pay streak 15 inches in width.

The 80-stamp mill of the Smuggler-Union M. Co., at Telluride, is crushing 300 tons of ore daily. The concentrate shipments from the mill and tailings plant amount to eighty carloads per month.

SUMMIT COUNTY.

The Colorado & Wyoming Co. operating the Wellington-X-10 U-8 group of lodes, on Mineral hill near Breckenridge, report in the main crosscut tunnel, at 580 feet, a vein of iron, lead, silver and zinc ore and at the 615-foot point an 18 inch streak of galena. The vein, for 33 feet in width, is a milling proposition and a concentrator will be built, say R. W. Foote, G. H. Evans and O. K. Gaymon, the owners.

Superintendent J. Hickey is driving the main tunnel of the Dreadnaught mine near Breckenridge.

The owners of the Bird's Nest group at Kokomo propose driving a crosscut for drainage. The tunnel will cut five veins before reaching the Bird's Nest at 250 feet in. Owing to a flow of water it was found impracticable to sink on the Bird's Nest.

B. S. Revett has organized the Oro Dredging Co. to operate in French gulch, at Breckenridge, and will operate two dredgers to cost \$75,000 each.

H. D. Crawford, J. B. Allind and S. M. Stuart, of Denver, have bonded for \$25,000 a group of claims northwest of Frisco. They will build a mill on the Victoria claim and work the Victoria vein, a free-milling ore.

The Wellington mine, near Breckenridge, is being opened up by lessees R. W. Foote et al. Machinery is being put in and the lower tunnel is near the vein.

TELLER COUNTY.

Last week the night shift resumed work in the Arequa mill at Cripple Creek, under lease by A. H. Heller, who has been operating but one shift. He has bought the dump of the Wild Horse mine, of the United Gold mines. Work has been resumed on the Little Ella, on Raven hill, Cripple Creek.

Shipments were resumed last week from the Mollie Kathleen, on Womack hill, Cripple Creek. H. D. Gortner, owner, says the ore is coming from the 700-foot level.

It is reported two cyanide mills will be built near Gillett, one of which will work the tailings dump of the Gillett mill, with a capacity of fifty tons a day. The other will be erected by S. M. Dilts, who owns thirty acres on Carbonate hill, near the Michigan pipe line, which will furnish water for mill purposes.

Shaft No. 3 on the Portland, at Cripple Creek, is down 1250 feet and cutting a station begun. The first level run out will be to the Burns shaft, which will be cut at 1000 feet.

That portion of the Jeremy Sample mine, Cripple Creek district, under lease to Bahbitt Bros., is producing twenty-five tons per week from the levels at 200 and 400 feet, the rock averaging \$40 per ton.

The Par Value G. M. Co., D. Heaton manager, operating four properties on

Battle mountain, near Victor—the Dillon, the north end of the Monument, the Mary Cashen and the north half of the Coriolanus. From these, except the Monument, they are shipping. The Dillon sends out a car daily of \$50 grade and the Coriolanus a car a week of mill ore. A crosscut is being driven at the 500 level of this mine to cut the extension of the Ajax vein.

H. P. Reiton, operating blocks 26 and 27 of the Bonanza King, on Gold hill, Cripple Creek, is building ore bins and will begin hoisting ore this week from the recent strike on the property.

Lessees Best & Hanson, operating the Zoe, on Beacon hill, Cripple Creek, have resumed sinking and will sink an additional 75 feet to cut a station.

Machinery is to be installed by the Hildebrand Co. on Grouse mountain, near Cripple Creek. The shaft of the Hildebrand is down 400 feet.

The Blue Flag mine of Raven hill, Cripple Creek, is being retimbered and machinery will be put in.

The Santa Rosa G. M. Co. has granted a lease on its Belle City claim on Guyot hill, north of the El Paso group, to F. Case of Cripple Creek for two years at 20%, the lease requiring sixty shifts a month. This claim has a shaft down 100 feet.

The Ella mine, at Cripple Creek, has resumed with E. Hawk superintendent.

The Gold Temple G. M. & L. Co., leasing on the west block of the Gold Sovereign, at Cripple Creek, shipped two carloads of \$40 ore from the 650-foot level last week.

The lessing company operating the C. O. D., up Poverty gulch, Cripple Creek district, found it impossible to lower the shaft to 900 feet, on account of water, and are drifting at 850 feet.

The pump at Stratton's Independence, Cripple Creek, has been lowered to 1400-foot level and is in place. The water column is being lowered, but so as to not interfere with the hoisting of ore.

Osborne & Clements, on the Tornado of the Elkton Co., Cripple Creek, made output of 200 tons in January of ore running \$50 per ton.

W. Wilson, lessee, has begun work on a block of ground on the Gregory, near Cripple Creek.

The Mary McKinney M. Co., Cripple Creek, has opened up the No. 2 vein in the third level, showing 4 feet wide, assaying three ounces gold.

The Post says the gold output for Cripple Creek district during the month of January amounted to \$1,943,800, and the tonnage 59,905—a reduction from December, when the output was slightly abnormal on account of annual clean-ups.

Plant.	Tons.	Value Per Ton.	Gold Value.
Portland.....	7,000	30	\$210,000
Economic.....	3,150	27	85,000
Aequa.....	1,600	5	8,000
Dorcas.....	2,800	35	98,000
Telluride.....	2,300	20	46,000
Standard.....	12,000	25	300,000
Colorado City.....	9,000	25	225,000
Union.....	9,500	23	218,500
Smelters.....	12,555	60	753,300
Totals.....	59,905		\$1,943,800

The Telluride mill at Colorado City is increasing its capacity to 200 tons per day. Roasters are being put in at the Dorcas and its capacity will be increased to 200 tons daily.

Manager C. W. Knox of the Laura Lee, at Cripple Creek, under bond and lease to Boston men, will resume this week. A payment of \$5000 has been made on the bond. The main shaft is down 130 feet and will be sunk to 1000 feet. The Laura Lee claim adjoins the Addie C. on Mineral hill.

Manager C. Redpath of the Friday Leasing Co., operating the Friday claim on Tenderfoot hill, Cripple Creek district, says they are drifting on the 200-foot level to cut the extension of the Hoosier shoot.

G. L. Keener, manager the Mary McKinley mine at Anaconda, has been granted a two years' lease on the Sunset-Eclipse mine at Cripple Creek. The tunnel on the east end of the property will be driven ahead to prove the course of the vein and a new shaft will be sunk.

Lessee Price, working on the Flower of the West mine on Squaw mountain, near Cripple Creek, is driving a tunnel into the hill and has cut several veins, one of which is being drifted on.

Lessee Grant & Co., at work on the Currency claim on Beacon hill, Cripple Creek, have cut ore at a depth of 90 feet, the vein showing 2 feet wide and assaying \$15 in gold.

Lessees Wynkoop & Co., Cripple Creek, operating the south end of the Little Bessie under lease, have the shaft down 210 feet and will sink to 400 feet.

The Gold Dollar Con. Co. has granted a lease to C. Tillery and S. Camp on the ground north of the Gold Dollar shaft

and south of the south sideline of the Zoe. They will go to a depth of 500 feet.

A steam plant of machinery is being installed on the Henry Adney claim on Beacon hill, below the Old Gold and the C. K. & N., Cripple Creek, by M. B. Burke & Co., lessees.

The Mutual M. Co., operating a lease on the Amanda property at Windy Point, Cripple Creek, have the main shaft 200 feet deep and are driving south, cutting through a basalt dike to catch the wall when drifting will begin.

The Forepaugh G. M. Co. has granted a lease on the north 400 feet of its Forepaugh claim, Cripple Creek district, to J. R. Dray for four years. The Forepaugh is on Squaw mountain, adjoining the Alhambra on the south. The lessee will sink a shaft.

L. Montaigne & Bros., operating block 8 of the school section northeast of Cripple Creek, have resumed sinking on their lease and will go down to 550 feet. They are drifting in the 450 foot level.

The Sunset-Eclipse Co. has granted a two-years' lease on its entire group, Cripple Creek district, to G. L. Keener, who will drive the tunnel on the east end of the property to prove up the course of the vein and then sink a working shaft. The Sunset-Eclipse has been developed to a depth of 500 feet by a shaft and several levels.

E. Gortner, operating the Mollie Kathleen mine, on Tenderfoot hill, Cripple Creek, is driving a raise on pay ore from the 700-foot level and getting values of \$65 per ton. Bad air prevents taking out rock enough for shipping.

The United G. M. Co. has a lease on the upper level of the Deadwood, Cripple Creek district. There are three other sets of lessees working.

The English-American G. M. Co. has taken a sub-lease on block seven of the school section, Cripple Creek. At a depth of 175 feet they are drifting to strike the ore shoot opened up on the 90-foot level.

IDAHO.

BINGHAM COUNTY.

The Idaho Gold Dredging Co. of Salt Lake City, Utah, has organized and will begin operations this week along the banks and shoals of the Snake river, between Shelley and Blackfoot. T. Geddes of Tonic, Utah, is president, with W. C. Bogue, S. O. Snyder, S. V. Shelp, F. B. Stephens directors.

BOISE COUNTY.

The Ebenezer mine, near Placerville, under bond to Southworth & Co., reports an 18-inch shoot of gold ore in the shaft at a depth of 105 feet.

ELMORE COUNTY.

J. L. Hill & Co. of New York City have bought the Kimberly and Jewel group on Bear creek, in Marshall Lake district, for \$65,000. R. G. Law of Boise is manager.

The Rose Etta M. & M. Co. of Salt Lake City has incorporated to operate the Planet-Rose Etta group in the Bear Creek mining district; W. A. Potter, D. H. Wenger, M. R. Brothers, L. P. Palmer and W. L. Lowry, directors.

IDAHO COUNTY.

Three feet of \$60 free-milling ore is reported in the north drift of the Wise Boy at Hump by Manager W. Moore. A. W. Crittenden of Republic, Wash., is foreman, and has thirty men getting out ore from the No. 1 level and drifting north and south in the lower level. A raise from the north drift, No. 2 level, will be driven to No. 1, which will give stoping ground enough to keep the 10-stamp mill in operation.

The Noisy Boy G. M. Co. has incorporated at Spokane, Wash., F. P. O'Neill, R. Strang, D. S. Prescott, A. D. Coplen, J. E. Meyers, to operate the Noisy Boy Nos. 1, 2 and 3, in Thunder Mountain district, on Sugar creek, 20 miles south of Thunder Mountain.

LATAH COUNTY.

The Idaho Mica M. Co. the last two weeks have taken out four tons of mica from their claims on Bear creek, 13 miles northeast of Troy. The vein is said to be 30 feet wide and samples of mica run from 2x2 to 10x12 inches in size. The owners are S. G. Kitchen and L. M. Steelsmith of Troy and P. J. Scallon of Coeur d'Alene City.

NEZ PERCES COUNTY.

J. M. Edwards, president of the Gold Crown M. Co., which owns a group of prospects on Snake river, near mouth of Grand Ronde river, says they have opened up free-milling gold ore assaying \$20 in a 4 foot ledge cut on the surface. The ledge has been uncovered by test pits for 300 feet.

C. M. Stearns is operating a group of claims on Clearwater river, above Kamiah, and near the Jack-Bettman group. Near the Jack-Bettman group the Lav-

erty group is being developed by the Plattsburg-Idaho M. & M. Co., recently incorporated by Laverty Bros. and J. C. Bridwell of Kamiah. Two tunnels have been run on the ledge, one 430 feet and the other about 210 feet, besides a shaft 100 feet deep. Below this is the Alto-Idaho M. Co. mines of A. H. Pardee, Philadelphia, Pa.

G. A. Neerhood, J. A. Husebye and W. L. Kilkinson of Lewiston have bought eighty acres of marble quarries 3 miles above Wild Goose rapids, on the Snake river, on the Idaho side, and will develop them. The quarries are above those operated by A. Vinson of Walla Walla. There is also a body of granite suitable for building stone.

SHOSHONE COUNTY.

W. Dahl of the Chicago & Pierce M. Co., says they have 320 acres of placer ground on Oro Fino creek, 4 miles above Pierce City, and will build a ditch 28 miles long and put in an hydraulic elevator. Dahl, with S. S. Johnson, W. J. Harris and G. M. Williams have organized the Chicago & Spokane Placer M. Co. to work 800 acres on Oro Fino, Canal and Rhodes creeks, near Pierce. The Santiago quartz mine, 4 miles north of Pierce City, has a 12 inch vein and a 2-stamp water power mill in operation. A crosscut to be 700 feet long has been started on the Crescent. The Klondike at Pierce will resume in the spring and the 5-stamp mill increased to twenty stamps. The American Placer M. Co. will install an hydraulic plant to cost \$25,000 on Oro Fino creek.

Superintendent C. C. Smith of the Oro Grande mine, 12 miles from Pierce, says he has men at work crosscutting to the ledge, and will run drifts either way.

The Paragon M. Co., near Murray, is sinking the double-compartment shaft with two shifts, says Manager Stedman, and is down 75 feet. When the 300-foot level is reached a crosscut will be run. The bottom of the shaft is in quartzite. The Benton M. Co. was incorporated at Burkelast week, John and James Callahan, W. H. Smith, B. N. Hillard, T. Anderson, to operate a group of claims near Burke.

Work has been resumed on the Apex mine, north of Wallace. The tunnel, which tapped the lead, will be driven another 100 feet. In the spring power will be obtained from the Washington Water Power Co. to run an air compressor.

The New Jersey G. M. Co., which has bought the South Fork gold mines, 3 miles east of Wardner, on Gold Run creek, will put up a 10-stamp mill.

KENTUCKY.

LIVINGSTON COUNTY.

F. M. Barnard of Paducah, superintendent of the Pittsburgh Fluor Spar M. & M. Co., reports that a vein of high-grade lead ore has been struck in his mine near Smithland, on the Cumberland river.

MICHIGAN.

HOUGHTON COUNTY.

Superintendent Wilcox of the Mass Con. Copper Co., near Houghton, says, with one head stamping 260,000 pounds of copper a month are produced. There are 400 men employed at the property and the company has three drills in operation. Five additional drills will be put in.

The Mohawk, near Houghton, is stamping 900 tons of rock daily.

Near Houghton, the one head at the Atlantic mill is in operation, all the rock coming from underground, not taking any from the stock pile on the surface.

The superintendent's report for 1902 of the Victoria Copper M. Co., near Houghton, shows 5640 feet of openings made during 1902, bringing total openings to 20,299 feet; the two veins came together at the 15th level; dip of vein changed from 61° horizontal to 55°, bringing the shaft in the foot wall from 25 feet at the 13th level to 60 and 80 feet at the 14th and 15th levels, respectively. Owing to fact that shaft has been in foot wall, trouble was had with hanging wall of shaft, necessitating timbering the same below 14th level; 8th level was in stamp, mass and barrel ground. To 550 feet west of shaft 10th level was in vein of heavy stamp copper and in fine stamp copper to 700 feet. The 12th, 13th and 15th levels have been in stamp and barrel drifts. Copper-bearing part of vein in all levels varies from 6 to 40 feet.

Shipments of refined copper from the Lake Superior district are going forward rapidly and no metal is accumulating at the local smelters. The Lake Superior Smelting Co. has done a large business recently at both its Dollar Bay and Hancock plants, refining increased amounts of mineral from South Range mine.

Oscoda No. 5 shaft, near Houghton, resumed hoisting Feb. 2.

MASON COUNTY.

At the Quincy mine the incline shafts are down 6000 feet. The skips are being changed in shape, so the rock will not roll out where the shaft is flatter.

The Evergreen lode, where it is cut by the Butler tunnel in the Adventure mine, is 12 feet thick. The lode shows mass and barrel copper—masses ranging in weight from 100 pounds to a ton.

ONTONAGON COUNTY.

The Hamilton mine, adjoining the Norwich, near Ontonagon, will be reopened by Milwaukee and Gogehic interests.

MONTANA.

BEAVERHEAD COUNTY.

The Kent mines, near Bannack, are being worked under bond and lease to Butte men, with W. A. Butler superintendent. —Mathews & Peterson report a strike on the Blue Jay.

The July Flower mine, near Dillon, is bonded for \$20,000 to N. W. Pearson of Butte.

CARIBOU COUNTY.

The Northern Pacific R. R. Co. will develop its group of 1600 acres of coal land lying east of Red Lodge, where the fields of the Rocky Fork Coal Co. are being developed. H. Horn is manager.

CUSTER COUNTY.

C. E. Barnum of the Silver Top Coal Co., operating the coal lands near Garland, says the mine is 12 miles from a railroad. He will transport the coal to Garland by ten steel wagons, having 12-inch tires and a capacity of twelve tons each, hauled by a traction engine of 83 H. P. The mine is developed by two tunnels, the face of one showing a 5 foot vein of coal.

DEER LODGE COUNTY.

The Cable mine at Cable has been unwatered and development resumed with twenty men at work. At the head of Flint creek the Milwaukee Gold Extraction Co. has twenty men at work, says Superintendent G. H. Savage.

FERGUS COUNTY.

Superintendent C. F. Gadsen, the New Mines Syndicate, operating the sapphire mines at Yogo, says sixty-six men are at work; but operations will be enlarged the coming season.

JEFFERSON COUNTY.

It is reported a body of galena has been cut in the raise being driven to connect the lower tunnel with No. 2 at the Bullion mine, near Basln. The lower tunnel is in 1925 feet.

MADISON COUNTY.

F. B. Dickerson and C. C. Adkins are working the Atlanta lode of the Forre M. Co., on Mineral hill, near Pony.

J. King, owner of the U. S. Grant mine, near Virginia City, has resumed development.

Two 100 H. P. boilers are being installed at the Galena mine, near Sterling.

MISSOULA COUNTY.

The Dennemora G. & C. M. Co. has incorporated at Wallace, Idaho; B. Scott, E. Johnson, O. Nordquist, E. and S. Johnson, to operate a group of six claims near Saltese.

POWELL COUNTY.

C. Hartman and T. Cooney have a bond on the Ophir placer claims below Ophir, comprising a strip 2 miles long and $\frac{1}{2}$ mile wide.

SILVER BOW COUNTY.

The Butte Reduction Works, an old and antiquated smelting plant, will be abandoned and all the ore from the Clark mines will be treated at the new Washoe smelter in Anaconda. That change is to go into effect on May 1.

NEVADA.

ELKO COUNTY.

Manager A. Carlson of the Deer Creek mine, near Charleston, says he will put up a stamp mill of fifty tons daily capacity. The property is 45 miles northeast of Tuscarora. The ore runs \$20 in gold.

LINCOLN COUNTY.

At the Iris claim at Deer Lodge, owned by Moody & Dameron, the shaft is down 100 feet in 6 feet of ore assaying \$20 in gold.

J. B. Gilbert & Co. are developing a turquoise mine in the Hardscrabble mountains at Crescent.

The double-compartment shaft on the Green Monster mine at Sandy is down 175 feet and in ore. The mine is owned by the Hearst estate and F. O. Wilkinson is superintendent.

C. Gracey has put in a hoist at the Techaticup mine at El Dorado canyon, and will sink the shaft, which is down 80 feet below the tunnel level, to 500 feet.

In the Quartette mine at Searchlight the 600-foot station is finished, the lead crosscut and drifting begun. The cross-

cut at this level shows 14 feet of ore. The storage reservoir is finished. Work to connect the fifth and sixth levels has been started.

J. W. Tuck, working a group of claims on Spirit mountain below Searchlight, reports opening up a body of free gold ore. The vein was cut in the tunnel and 11 feet of ore exposed. In the shaft 3 feet of ore were cut. The mines are near the top of the mountain and 7 miles from the Colorado river.

LYON COUNTY.

The Nevada Reduction Co. are increasing the capacity of their cyanide plant at Dayton.

The mill at the Como-Eureka mine in Como district is in operation, using electric power from the plant at the Douglas dam on the Carson river.

NYE COUNTY.

The Templar group of three claims and a fraction adjoining the California-Tonopah on the west, near Butler, is being developed by Superintendent L. L. Patrick, who has let a contract to sink 200 feet. This property is owned by Mecham & Co. of New York.

The third shipment of ore from the mines of the O'Meara-Lynch Co. at Lone mountain, near Butler, was made to the smelter at Salt Lake City last week, making ten carloads to date. The ore nets the company \$3000 a car.

Manager L. L. Patrick has begun work on the Pinto group of fifteen claims adjoining the Newhouse property, near Butler. Four veins have been located on the Pinto group, and surface croppings show values in gold and silver.

Superintendent G. Jones of the Pactolus M. Co. reports a vein of gold-silver ore struck on the Pactolus mine, 50 miles north of Butler.

The Colehan M. Co., on Gold mountain, near Butler, will let a contract for sinking and timbering a double-compartment shaft to a depth of 200 feet.

A contract has been let to sink a shaft to 200 feet on one of the three claims of the Temple-Syndicate M. Co. of New York. The ground adjoins the California-Tonopah on the south. L. L. Patrick is superintendent.

H. M. Hashrouck, A. McIntyre and G. Kernick, operating northwest of Gold mountain and 6 miles from Butler, report having opened up a ledge of quartz on the surface, in porphyry, carrying \$30 gold, with silver and copper.

The tunnel being run on the Tonopah G. M. Co.'s group at Gold Mountain, near Butler, is in 120 feet, and a vein cut assaying \$47 in gold and silver. The tunnel will have to be run 130 feet to tap the ledge which crops on the surface.

At the Colehan Co. claims at Gold mountain, the shaft is down 40 feet in porphyry. Last week the company let a contract to sink a double-compartment shaft to a depth of 200 feet.

W. D. Nelligan, owning a group on Lone mountain near Butler, says on one claim a shaft 50 feet deep has been sunk and a ledge 4 feet wide exposed, which assays \$25 gold and silver.

The main shaft at the Tonopah-Union, near Butler, is down 125 feet and in ore. A whim is in operation and 2 feet a day are made.

Assayer T. F. Niland, at the Newhouse mines at Hannapah, says he has found by analysis that their ores carry platinum up to \$200 a ton. It occurs as platinum-diarsenide, in minute cubes or cubo-octahedrons, with a metallic luster. This is the only known native compound of platinum (says Dana's Mineralogy). Its occurrence has also been noted in the Ramler mine at Grand Encampment, Wyo.

WASHOE COUNTY.

The Slip mine at Olinghouse is extracting ore from a 6 foot vein and the tunnel is in 620 feet. There are sixty-five men working in the mines at Olinghouse and three mills running.

NEW MEXICO.

COLFAX COUNTY.

Drilling is begun by the New Mexico Oil Co. at Raton, on the McKown ranch.

SANTA FE COUNTY.

President Sopers, the Bayard M. Co., owning placers at Golden, says the mill will be operated to make a test of gold-bearing cement beds occurring in that vicinity.

SOCORRO COUNTY.

A. B. Finch and C. T. Brown have bought the Ida Hill group of the Ida Hill M. & S. Co. at Kelly, and will consolidate with the Graphic group of mines.

OREGON.

BAKER COUNTY.

Superintendent McEwen of the California mine, near Sumpter, is raising from No. 5 tunnel to No. 4, to complete the

system of chutes for stoping the upper levels through the Blacksmith tunnel.

Manager J. K. Romig of the Sanger mine, near Baker City, says the Walla Walla Development Co., operating the Sanger mine, has been reorganized. He has twenty-five men at work and will reopen the property.

Manager J. M. McPhee of the Golden Wizard mine, Deer Creek district, near McEwen, is putting in development machinery and a 100-ton concentrating plant will be installed in the summer. The shaft will be unwatered and sunk 155 feet deeper. J. Murrin is superintendent.

Manager McPhee, of the Golden Wizard mine, near Sumpter, says the shaft has been unwatered, and sinking resumed by contractor J. Murrin, who will sink to the 300-foot level. The hoist being put in will have a capacity of 1200 feet. The station pump, to be installed at the 140-foot level, will raise 1000 gallons per minute 500 feet.

The Standard G. & C. M. Co. will build a mill at their mines near Sumpter, says Z. Houser, one of the owners. The work in the lower tunnel of the Standard continues and shipments of cobalt concentrates are being made.

Twenty stamps are dropping at the Golconda, near Sumpter, crushing 100 tons of ore daily.

The Highland G. M. Co. has bought the El Dorado group on the mother lode system, near Sumpter.

The Greenhorn G. M. Co. has been incorporated to operate the Worley mine, located in the southern part of Greenhorn—J. Fawcett and W. Killen.

The Little Cracker G. M. Co. has incorporated—E. Butze, R. L. Turner, D. L. Willard—to operate on Little Cracker creek, near the Cracker-Oregon mine, near Sumpter.

Superintendent Jackson, of the Killen, Warren, Stewart Co.'s Cracker-Eagle mine, near Sumpter, reports having cut through the ledge which is 105 feet wide at a depth of 100 feet, showing 42 feet of milling ore which runs \$3 per ton. The crosscut tunnel is in 210 feet.

The Bannock Burn or Knapp group of four claims, 8 miles northeast of Sumpter, has been sold to the Highland G. M. Co., N. J. Sorensen, president.

GRANT COUNTY.

The Oregon M. & D. Co. has incorporated at Baker City to operate the G. Izly and Red Cloud groups, near Granite and adjoining the La Bellevue mine; J. L. Rand, F. Davis, H. S. McCallum, J. T. Donnelly. H. L. McClane is manager.

Manager T. B. Carsons of Liberty, Wash., has resumed work on the Milwaukee placer, 3 miles down Granite creek from Granite.

W. Cleaver, operating on the Copper Ridge group, adjoining the Standard and the Willie Boy, near Quartzburg, says they have opened up the extension of the Standard's cobalt vein, showing values in gold and copper with the cobalt.

It is reported that the Geiser-Hendryx Investment Co. has a bond on the Cougar mine, near Granite.

SOUTH DAKOTA.

CUSTER COUNTY.

The Interstate G. M. & M. Co. has incorporated to operate a group of claims near Custer, adjoining the mines of the Grantz G. M. Co. W. H. Godden of Emmetsburg, Iowa, is manager.

A pocket of ore carrying tellurides was found last week on the Roosevelt group of the Grantz G. M. Co., near Custer. A drift was started west in the shaft and is in ore 20 feet.

The Cuyahoga M. Co., whose mines are 12 miles east of Custer, will resume development work. They have been shut down while putting in an air compressor and drill pumps. They are sinking a winze in the breast of a 600-foot tunnel on a vein of gold ore 20 feet wide, assaying \$10 per ton. In driving this tunnel they crosscut a vein of tin ore. As soon as the mine is opened up a wet crushing cyanide mill will be built to recover the gold values. The company is composed of Cleveland, O., men, and they have 400 acres of lode claims and millsite.

One hundred and nine samples recently taken by the Grantz G. M. Co. on the Roosevelt group, near Custer, not including concentrates, gave an average assay value of \$40 in gold. Some of the ore is schist veined, with quartz and mica, and the Interstate G. M. & M. Co. has begun development. There are 195 acres. A sawmill is on the ground and cutting lumber for a shaft house, office building and mine timbers. T. P. McLaughlin is superintendent. The Gladiator Co. is developing the Gold Fish group of claims, and is taking out ore. The company will put up a mill.

LAWRENCE COUNTY.

The Home M. Co. has resumed after a

shut down. A shaft is being sunk on City creek, Deadwood, following a ledge of auriferous pyrite, carrying copper sulphide. A steam hoist will be put up.

A quartz mill will be installed by the Lucky Strike M. Co., near Roubidax, for their Box Elder mine. The mill will have a daily capacity of twenty-five tons.

Groshong Bros. of Galena are opening a gold bearing vein 40 feet wide, 1½ mile southwest of Roubidax.

On Annie creek, 8 miles southwest of Deadwood, the University and Aksarben companies are developing their claims and have 500 tons of siliceous ores on their dumps. The management of these companies believe the ore reserves in the mine will warrant mills in the spring. Sixteen men are employed.

Three hundred employees of the Golden Reward smelter at Deadwood have gone on strike because of one man being laid off. About 700 others will be idle, the company having decided to close two of its mines.

The Pennsylvania G. M. Co. is developing its group on Deadwood and Rutabaga gulches, near Central City, and are blocking out shipping ore. They have one vein 14 feet wide opened to a depth of 300 feet and for 1000 feet on its course mill tests have shown an average value of \$30 a ton. It carries sylvanite and marcasite. Building and mining operations are under way on the group of the Gladiator Con. G. M. & M. Co., adjoining the Pennsylvania. The Big Four M. Co. is driving a crosscut through the phonolite, on its property across Deadwood gulch from the Pennsylvania and above the Gladiator. It has a steam hoist and is putting in an air compressor.

Secretary D. N. Heizer of the Spearfish G. M. & R. Co., near Deadwood, says the output for January was 6000 tons and the grade of the ore higher than that of any preceding month. During December the ore averaged \$5 10 in gold per ton, and in January \$7. The cleanup for the first half of the month resulted in a gold bar 900 fine and weighing 948.87 ounces. The plant is treating 200 tons of ore per day. It is the intention to bring the plant up to its full capacity of 275 tons as soon as other stopes are opened in the mine.

The Yellow Jacket G. M. Co. of Rapid City is at work on 140 acres of mineral land near Custer Peak.

PENNINGTON COUNTY.

The National smelter, at Rapid City, of the Horseshoe M. Co., is handling 300 tons a day. The Horseshoe Co. is supplying the ore from the Lucile and Mark Twain mines, in Lawrence county, shipping over the Elkhorn railroad. Flux is from Fergus county, Mont., where the company owns an auriferous pyrite mine.

TEXAS.

HARDIN COUNTY.

C. H. Markham has bought the ground of the Beaumont & Saratoga O. & P. L. Co., in the Saratoga oil field, near Saratoga, for \$320,000. The property of the company consists of five tracts of land, containing 819 acres in all. There are two flowing wells yielding oil at present.

UTAH.

BEAVER COUNTY.

The Wild Bill Co. shipped a car of high-grade ore from the Burning Moscow, near Milford, last week.

BOX ELDER COUNTY.

The Irene G. M. Co. has incorporated; P. A. H. Franklin, J. A. Van Pelt, A. D. Beeman, T. Botkin at Salt Lake City to operate the Irene Nos. 1 and 2, Chief, Major, Atlantic and Oregon at Park valley.

GRAND COUNTY.

President Ray of the Westwater Oil & Asphaltum Co. at Westwater says operations are begun on the refinery and several oil drilling rigs will be put to work.

IRON COUNTY.

The mill of the Johnny M. Co. at State-line is in operation.

JUAB COUNTY.

Work on the May Day mill at Eureka is stopped temporarily.

At the Little Chief mine, near Eureka, they are stoping on a 3 foot body of lead-silver ore, and a carload of sorted ore was shipped this week.

Work in the Northern Spy shaft of the Carisa at Tintic has been discontinued until the steam hoist at the Carisa shaft has been moved over. Ten days' work after the change is made will complete the connection with the Sioux-Ajax tunnel.

The management of the Centennial-Eureka at Tintic will sink the shaft 500 feet deeper.

PIUTE COUNTY.

It is reported the Trapper's Pride mine

of the Madsen G. M. Co., at Kimberley, has been bonded to Eastern men for \$150,000.

SALT LAKE COUNTY.

The strike on the 1300 foot level of the Brooklyn of the Bingham Con. Co., on the Dalton & Lark side, near Bingham, shows in the crosscut 24 feet of sulphide ore, carrying twenty ounces silver, some gold and 4% copper. Several carloads have been sent to the smelter.

The fourth furnace of the United States M. & S. Co., at Bingham, was blown in last week and 181,362 pounds of pig copper were shipped, says Manager Holden.

W. James, superintendent of Black Rock, near Salt Lake, says he will sink the main shaft an additional 100 feet.

The cost of producing copper by the Utah Con. Co. at the Highland Boy at Bingham is said to be 7 cents per pound, deducting precious metal values of \$2 to \$2.50 per ton from the cost of treatment and allowing a recovery of 69 pounds of copper to the ton of rock from the run of ore, which assays 4% in copper. Additional ore bodies have been opened up and it is proposed to double the capacity of the works. This will require also another aerial tramway for the transportation of the ore.

A cave-in in one of the stopes of the Old Telegraph mine in Bingham last week partially wrecked the house of J. Johnson, a miner, killing two of his sons.

It is reported that the examination of the property of the Boston Con., at Bingham, by R. Nichols of London, is to advise whether concentration or smelting will be the best treatment for their ores.

SEVIER COUNTY.

It is reported that Lellich & Mork of Salt Lake City have bought a group of claims on the copper belt in Deer Creek district, near Richfield, east of the Butler-Beck.

SUMMIT COUNTY.

Construction work on the zinc plant at Park City is completed and it is expected the plant will be in operation by Feb. 20, says Manager A. L. Dickerman. The plant will handle 80 tons per day, which capacity is to be increased to 100 tons daily. It is expected that zinc ores from other camps in the State will be treated at this plant.

A snowslide at Park City, Jan. 28, wrecked the Quincy mine shafthouse, carrying the structure into the valley below. J. Gaffney, engineer, E. J. Colter, station tender, and C. D. Frink, fireman, were killed and nine others injured. Assistant Manager E. Bamberger says repairs will be made and work resumed.

TOOELE COUNTY.

Manager G. H. Dern, the Con. Mercur M. Co., reports the following results at the new tailings plant on sluices portion of it. The tailings treated assayed \$1.29; after treatment, 41 cents, an indicated extraction of 68.5%. This result was obtained from the sluices, the sands submitted to the usual process not having been accounted for, and they were entirely free from slimes when placed in the leaching tanks. The only difficulty experienced in making a high saving of the values in Con. Mercur ores has been the large percentage of slimes accompanying tailings. These would clog the tanks and prevent the proper percolation of solution. The process now being tried is effecting a separation of the slimes from the sand.

Manager J. Dederichs, the Black Diamond Co. property at Stockton, says on the 100-foot level the vein has been opened up for 60 feet, showing 14 feet of ore carrying \$7 gold, 24% lead and fifteen ounces silver. The Honerine tunnel will tap the ledge at 500 feet below the surface, and enable the Black Diamond to prospect its territory without hoisting.

G. Moore, manager of the Sunshine Co.'s mines at Sunshine, Camp Floyd mining district, says a slimes plant similar to the one in operation at Mercur is contemplated for Sunshine.

UTAH COUNTY.

In Silver Lake district, near American Forks, Superintendent J. Cleghorn reports uncovering a vein of copper pyrites 20 feet wide and assaying 12%. This property has been bonded by an Eastern company for \$40,000. Shipments of ore have been made from the Milkmaid. A mill and an electric road from American Forks to Deer creek are proposed by the company bonding the Cleghorn group. It is reported the Miller Co. will sink a double-compartment shaft to 1000 feet.—The Pacific G. M. & M. Co. has had men at work all winter. They are running a tunnel to tap a vein which on the surface assays eighty ounces silver, 27% lead, with gold and copper values. The tunnel is in 320 feet.

WASHINGTON COUNTY.

Manager G. Snyder of the Dixie copper

group at St. George says the smelter is in operation, and the main shaft will be sunk below the tunnel level.

WASHINGTON.

CHELAN COUNTY.

T. Maloney, superintendent of the Chelan T. & S. Co., says: "Our company is building an electric railroad from the mouth of the Chelan river, on the Columbia, to Lake Chelan, 3 1/2 miles. The company will have steamboats from there to Railroad creek, 45 miles up the lake, where it will build a smelter and copper matting plant of 300 tons daily capacity. From the smelter a narrow gauge steam railroad will be built 10 miles to the Holden mine, with spurs to properties."

FERRY COUNTY.

J. W. McCann, who has a lease on the North San Pol, near Republic, has begun development work, and will sink the shaft an additional 100 feet to the 225-foot point.

W. G. Madison, president Bodle M. Co., near Republic, says twelve men are at work in the mine, drifting on ore on the No. 3 level and driving ahead No. 4 tunnel. A survey of Toroda creek has been made for power to run a mill, which will be installed at the Bodle mine.

OKANOGAN COUNTY.

A. M. Riste and G. Bowers have men at work on the Ruby claims, on the east slope of Mount Chacapa, south of the Golden Zone, near Loomis.

A strike of ore carrying values in gold and copper is reported in the shaft of the Grant mine at Chesaw, bonded to W. T. Mendenhall & Co.

STEVENS COUNTY.

The discovery of uranium is reported in claims owned by Grutts & Mulligan, in O'Toole mountain, 12 miles from Bossburg. The uranium is associated with other minerals.

The Silver Butte mine on Deep creek, near Northport, has resumed shipments of silver-lead ore. C. C. Knutson is manager. The coke situation is assuming a more favorable aspect, according to local smelter men, and it is expected the entire plant of the Northport S. & R. Co. will be in operation by March 1. Four blast and two calcining furnaces are running and handling 1000 tons per day.

The Pearl G. M. & M. Co., operating the Pearl group near Republic, is driving a tunnel, which is in about 45 feet and has crosscut a 12-foot vein of quartz, says superintendent Howe. The Pearl group is west of the Zala M. and has a parallel vein which crops on three claims of the group. The Howard Fraction carries the cross-lead and there is a shaft down on it 50 feet, showing shipping ore.

The fourth furnace at the Northport S. & R. Co. plant at Northport was blown in last week, and it is expected a fifth will be added by March 1st.

WYOMING.

CARBON COUNTY.

The Osceola mine, adjoining the Ferris-Haggerty of the North American C. Co., near Rudelaha, has been sold to New York men represented by C. F. Fishback, of Rawlins, Wyo.

FOREIGN.

AUSTRALIA.

Additions to the Mount Lyell Co.'s reduction works now enable the whole of the crude ore treated at No. 2 plant, where two furnaces are in operation, treating 1000 tons a day, to be smelted without the use of coke, making an estimated saving of \$100,000 a year. The same economy is being applied successfully to the two furnaces at No. 1 plant, the ore in one of which is being operated without coke and the other partly so. Another change recently made is in the reduction of the amount of hot air used in the furnaces. Where twenty-four men were formerly employed in firing the hot-air stoves the work is now done by six.

The Lake View Consols is reported earning a profit of \$35,000 per month. In the mine prospecting on an extensive scale is in progress in the lower levels of the Associated with encouraging results.

WEST AUSTRALIA.

Great Boulder Main Reef: Coolgardie field reports, December returns, 1402 tons crushed yielded 1119 ounces gold; average assay value of ore crushed, 17 dwts; extraction, 92%; mill shut down for six days overhauling plant. The main shaft has been sunk to 140 feet below the tenth level and crosscut started both ways at level No. 11.

Great Boulder Proprietary Gold reports crushing returns for month of December: At sulphide mill and by cyanide,

including 908 tons tailings, 8800 tons of ore crushed, yielding 13,879 ounces gold; at battery, 500 tons crushed, yielding 517 ounces; concentrates, 45 tons crushed, yielding 225 ounces; at Great Boulder No. 1 battery, nil. Total yield, 14,621 ounces; estimated value, £14,975.

BRITISH COLUMBIA.

An assay made by the Provincial Mineralogist indicates that the black sand of Carib o placer claims carries values in gold, platinum and osmiridium.

F. Griffith reports a strike of ore on his Westmount claim, on Ten Mile, near Sandon.

J. F. Collom, manager Arlington mine, near Slocan, is making arrangements for a mill to treat the ore of that mine. He says the process will be a combination of the electro-magnetic and cyaniding.

There are 800 men employed in Rossland camp—Le Roi has 360. War Eagle and Centre Star mines 312, Kootenay 40, Josie 50, White Bear 15, Velvet 20.

A zinc concentrator will be erected in the Slocan, says T. Jones, representing the Iola, Kas, smelter, who has been investigating the situation in the district about Slocan.

Manager Watson of the Fisher Maiden M. Co., at Silvertown, says three carloads of ore were shipped to the smelter at Trail last week. Assays showed 169 ounces silver, 6% lead and 15% zinc. The smelter fines 50 cents a unit for ore carrying over 8% zinc. With this fine and the \$13.50 charges from the mine to the smelter, the company netted \$598.11 from the last 22-ton shipment.

The East Crow's Nest Coal & Coke Co., composed of Spokane, Wash., men, have begun development work in the Crow's Nest Pass district. Vice-President A. L. Davenport says the company has bought 522 acres of coal land on the north side of the Old Man's river, 6 miles east of Frank, on the line of the Crow's Nest Pass Railroad, which crosses their property 200 feet from the main shaft. A sidetrack is built to this shaft. The river forms the south boundary of the company's land, a bluff on the north side of the stream exposing nine seams of bituminous coal from 3 to 9 feet in thickness. The shaft is down 480 feet on a 5 foot seam.

J. Lineham of Okotoks, Alberta, says of his company's boring operations in the Kootenay oil fields that oil of good quality was struck at 1100 feet. The oil being tapped spouted for some time, but finally diminished, owing to the influx of water. The drill is stuck at a depth of 1200 feet. It is proposed to construct a pipeline from the oil fields to Macleod. The company have control of one and a half section of land and will make further tests.

Manager W. Walde, one of the owners, has men at work on the Queen property on Sheep creek, near Salmo. They have the use of the Yellowstone mill.

Two stamp mills will be installed in Camborne camp, near Rossland. One on the Eva group, operated under bond by the Calumet & Hecla Co., will be a 10-stamp mill. The Oyster Criterion group in Camborne will have a 10-stamp mill.

The Velvet mine will put in more baby machine drills, says Manager Gray.

The Granby Con. M. S. & P. Co. will equip a machine shop to do all the repairs, constructing, etc., required about the mines.

"The results with the experimental plant installed to test Rossland ores with the Elmore process of oil concentration are satisfactory up to the present and a plant to work on a commercial scale will be built," says H. H. Claudet, metallurgist the Canadian Ore Concentration Co. "Samples from the Slocan, Similkameen and other districts have been treated. In one case, from a copper ore containing a slight amount of silver, there was extracted 80% of the copper and 71% of the silver. In another case, a gold-copper ore, 81% copper and 71% gold was recovered. In the third test, a gold-copper ore, the percentages of recovery were 76% in copper and 83% in gold. A point in connection with these tests is that percentage of recovery is uniformly greater where a plant is in operation than is the case with mere tests. For one test we prefer ore in lump, as the crushed product is exposed to oxidation, and the results secured not so satisfactory."

The Ivanhoe, at Slocan, has closed a contract to ship zinc concentrates to Iola, Kansas.

F. H. Oliver of Spokane, Wash., manager of the Morrison mine, in Deadwood camp, near Rossland, has contracted with the smelter for ore shipments, and operations at the mine will be resumed. A spur will be built from the Canadian Pacific to the mine.

Mining in the Kootenays and the Boundary districts is being hampered by the shortage in the coal and coke supply. The smelters have but a portion of their furnaces in blast. The coal companies at Fernie, Crow's Nest and Michel are mak-

ing coke, but their capacity is insufficient to meet the entire demand.

The Union Jack group of the Active G. M. Co., at Ymir, will install electric power and electric drills, says Superintendent Cameron. Last week, in tunnel No. 2, at a depth of 60 feet and 165 feet in, 4 1/2 feet of galena ore was struck. The company intends in the spring to install a sawmill to cut timber for shipment to the Northwest.

CUBA.

The iron mines of the Province of Santiago employ 4000 men. Americans employ 125 men at 85 cents per day in manganese mining. Some copper mines are being reopened.

KLONDIKE.

It is reported that a lower pay streak has been found on El Dorado creek, the former streak resting on a false bedrock. It is now thought there may be several pay streaks in the gravel beds of this stream, the working of which will give new life to the district about Dawson, as other creeks will be prospected for lower pay streaks.

KOREA.

F. L. Cole, superintendent of exploration of the Wunsan G. M. Co., near Chemulpo, writes: "The Wunsan mines are 350 miles south of Seoul. As yet the workings are not deep. There are 7000 natives employed who receive 25 cents per day. There are seventy white people at the mines, mostly Americans. The mill in which the ore is treated has 120 stamps and an additional 80 stamps are being put in. There is a cyanide plant." Under Cole's supervision are thirty-five prospects and one mine, employing in all 700 men.

MEXICO.

CHIHUAHUA.

M. Wicks and C. E. Delno of Austin, Tex., have bought the famous Sierra Rica mine and the Amella adjoining, making seventy-three pertenencias and several thousands acres of land surrounding them. At 300 feet depth in the Sierra Rica is a vein 2 meters wide of ore which runs \$100 per ton in silver. The group is in the Ojinaga district.

M. Wicks and C. E. Delno of Austin, Tex., have denounced 250 pertenencias of mineral ground in the Santa Eulalia camp.

P. Ginther, manager the Encinillas mines, 45 miles east of Santa Rosalia, says work has begun on the 80-ton smelter, with 200 men employed in the mine and plant. The shaft, down 320 feet, is being sunk.

Manager S. N. Dedrick, the Sierra Boluda mine, near Chihuahua, says he has 700 feet of development work done. The workings show an ore body 10 feet wide, averaging \$10 gold per ton, with silver to pay for mining and milling. On the Cinco de Abril mine, 15 miles distant, Dedrick has let a contract for 150 feet of work. The mine consists of fifteen pertenencias on the vein, which is 40 feet wide. The ore is free milling gold and silver.

LOWER CALIFORNIA.

(Special Correspondence) — The mine owned by the Viznaga G. M. Co. at Alamo has been boarded up and all work stopped. A strike was recently made and it is reported the managers wish to confer with the stockholders as to the plant needed. H. M. Russell of Los Angeles is president and F. E. Russell is superintendent at the mines. Considerable development has been done by this company and former owners. Recently a drift was run from the shaft and in 25 feet a 7-foot body of ore was cut, 18 inches of which is rich, while 600 pounds run through the mill necessitated a clean-up. The rock is a decomposed brown ore and is very soft.

The Aurora M. & M. Co., on the same vein, has been working and producing about \$20,000 per month. This is owned by Douglass-Lacy Co. of New York. Ensenada, Jan. 30.

SONORA.

The Palomitas claim, on the same ledge as the Lucky Tiger, near the Pilares de Teras silver mines, has been bonded to H. F. Smith and C. M. Stover of Philadelphia, Pa., for \$100,000.

The Cerro Escalado Gold Mines Co., near Nacosari, 100 miles south of Douglas, consists of a group of twenty-six pertenencias and a millsite. It is the intention to erect a 10-stamp mill this spring.

SIBERIA.

A St. Petersburg dispatch states that deposits of platinum have been discovered by diggers on the River Gusseva, a tributary of the Issa, in western Siberia. Government officials have gone to the district.

PERSONAL.

J. D. YOUNG, of Chicago, goes to Chihuahua, Mexico.

W. G. KING is Professor of Metallurgy at the State School of Mines, at Golden, Colo.

C. E. KNOX, manager Montana Tonopah, at Butler, Nev., is in Salt Lake City, Utah.

W. DAHL of the Chicago & Spokane Placer M. Co. of Pierce, Idaho, is in Chicago, Ill.

M. S. TAFT of Walker, Ariz., superintendent Victor mine, has returned from New York.

W. W. EMMETT is superintendent of the Colorado & Telluride M. Co. at Central City, Colo.

T. R. JONES is manager of the custom department of the United States smelter at Bingham, Utah.

MANAGER P. L. FEARN of the White Knob M. Co. mines and smelter at Mackay, Idaho, is at Mackay.

W. L. REID is mill superintendent Smuggler-Union M. Co., Telluride, Colo., vice W. H. Davis, resigned.

J. H. MACKENZIE of Chicago, Ill., is at Gilt Edge, Mont., looking over the Gilt Edge mining property.

W. GARRICK succeeds A. L. Taylor as manager W. T. Garratt & Co., brass founders, San Francisco, Cal.

F. F. FULLMER, manager of the Beatrice mine, in the Lardeau, is in Spokane, Wash., from Camborne, B. C.

M. L. REQUA of Oakland, Cal., has been elected president of the Pacific Steel & Wire Co. of San Francisco, Cal.

W. E. HUMPHREYS, secretary Japan Mines Co., San Miguel, Colo., leaves Denver next week on a trip to Europe.

PRESIDENT SOPERS of the Bayard M. Co. at Golden, New Mexico, is visiting their mines from Toronto, Canada.

W. L. WATTS, E. M., of Los Angeles, Cal., is at Camella, Cal., making examinations in the new oil district there.

J. C. CAMPBELL, superintendent of the Murchie mine, near Nevada City, Cal., has returned from San Francisco, Cal.

FRANK PAUL, manager of the Groux copper mine at Pilot Knob, White Pine county, Nev., is in San Francisco, Cal.

S. CAMP, former superintendent of the Elkton Co., Cripple Creek, is superintendent of the Isabella properties in the same district.

L. WALKER has resigned as superintendent of the Cracker-Oregon mine, near Sumpter, Or., and is succeeded by D. M. Waters.

T. DENNIS of the Rhode Island succeeds P. R. Roberts as superintendent of the Ad venture mine and mill, near Houghton, Mich.

A. B. W. HODGES, superintendent of the Granby smelter at Grand Forks, B. C., has returned from a trip to southern California.

E. S. CAMPBELL has resigned as manager of the New Year's group at McCahe, Ariz., and is with the Knickerbocker Co. He has gone East.

MANAGER J. C. UNDERWOOD of the Yerkes M. & M. Co., near Altar, Sonora, Mexico, has returned to Camp Yerkes from Nogales, Ariz.

J. M. PARKER returned last week to Colorado Springs, Colo., from St. Joseph, Mo., where he has been on business for the Washington G. M. Co.

J. P. TURNER, formerly with the United States M. Co. at Bingham, is superintendent of the Yankee Con. M. Co., Eureka, Utah, vice P. M. McCree, resigned.

W. H. DAVIS has resigned as mill superintendent Smuggler-Union M. Co., at Telluride, Colo., to take the management of a cyanide plant for the Idaho G. M. Co. at Weiser, Idaho.

J. B. COOK of Los Angeles, Cal., recently returned from a six weeks' trip through the mines of San Bernardino county, where he made some examinations for himself and associates.

A. L. TAYLOR has resigned as manager W. T. Garratt & Co., brass founders, San Francisco, Cal., to devote his time to the Calaveras Development Co., with hydraulic mines near Railroad Flat, Cal., of which he is president.

IN the Union Iron Works of San Francisco, Cal., at the annual election on the

4th inst., the following officers were elected: Chairman of the board, H. T. Scott; president, W. G. Dodd; secretary and treasurer, C. N. Champion.

GEO. H. GIBSON has resigned his position with the Westinghouse Co.'s publishing department of Pittsburgh, Pa., to accept a position with the B. F. Sturtevant Co. of Jamaica Plain Station, Boston, Mass. Mr. Gibson was formerly a member of the editorial staff of the Engineering News of New York City, and is a graduate of the engineering school of the University of Michigan.

Commercial Paragraphs.

THE Eagle Engine Co. of San Francisco, Cal., has installed a complete shop, 317 319 Mission St., and are already running overtime to catch up on orders for their distillate engines. H. L. Marsh is in charge of the sales department. Catalogues will be furnished on request.

THE Jeanesville Iron Works Co.'s Denver branch reports the following sales recently: Compound pump for Mexico, 1600 feet lift through 7 miles of pipe; 16x10x12 standard pump to Salda smelter; 12x4x12 solid end to coal mine, 800 feet lift; electric station pump shipped to Mexico, 1000 feet lift. Jeanesville shops are very busy on large contracts.

THE J. Hendy Machine Works of San Francisco, Cal., have finished and delivered three sets, duplex, belt driven, 14x18-inch air compressors for the Edison Electric Co. of Los Angeles, Cal., to be used on their tunnel work at the Kern river. They have also finished installing a hoisting and compressor plant for the Fresno Copper Co. of two 80 H. P. boilers, a 75 H. P. double cylinder, double drum hoist, one single steam 14x18-inch compressor, drills and cages.

Books Received.

"Manual for Resident Engineers," by F. A. Molitor, C. E., and E. J. Beard, C. E. Under this title a neat little volume of 118 + IV pages has been published. The book contains general information on construction work on railroads, and incidentally gives much valuable data on excavating generally, and contains many pointers for the use of those in general charge of such work where constant personal supervision is impossible; \$1 cloth; John Wiley & Sons, New York.

Catalogues Received.

Catalogue No. 15 of the Union Gas Engine Co. of San Francisco, Cal., finely portrays seventeen years of progress and prosperity in the building of gas engines. In this treatise are twenty-eight full page views of Union gas engines of different styles and sizes. A copy of this edition will be sent to any address on application.

Obituary.

W. H. JAMES of Denver, Colo., died Jan. 29th of heart trouble, aged 65 years. He went to Colorado in 1860, was active in organizing the Grant Smelter Co. and the Colorado Fuel & Iron Co., and had large mining interests at different times. He was a native of Monmouthshire, England.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

OIL BURNER.—No. 719,345. Jan. 27, 1903. L. H. Lewars, Golden Gate, Cal., one-half assigned to D. E. Garrett and H. J. Perreau of West Berkeley, Cal. This invention consists of an essentially horizontal steam or air conducting pipe and oil conducting pipe with the discharge end approximately at right angles with the discharge end of the steam or air pipe. Within these two pipes are fixed nozzles having conical ends, which are brought together at right angles, so that the oil delivery from the depending or vertical pipe is caught by the steam discharge from the horizontal pipe and thoroughly atomized and blown into the spray within the furnace, where it is to be ignited. The nozzles are screw-threaded or otherwise so fitted into the pipes as to be adjustable to or from the angle at which their axes meet. The object of the invention is to provide a burner of such character that the steam or air and oil are brought together at

the instant of their delivery from their respective nozzles in such a manner that the oil is blown into a very fine spray at the point where it is to be ignited.

ORE CONCENTRATOR.—No. 719,181. Jan. 27, 1903. Clarence Brown, Bishop, Cal. This invention is designed to separate the valuable portion of comminuted ore from its gangue. It consists in an ore concentrator, the combination of an open center frame; spring standards supporting the same; a circular table of disked form, having a hollow shaft leading from its bottom; a series of radiating strips upon the table, curved continuously in one direction and made highest at their inner or lower ends adjacent to the shaft opening and tapering and substantially merging into the surface of the table at their outer ends, a ring inclosing said shaft and having oppositely located trunnions journaled upon said frame; means for tilting the ring and fixing it in a tilted position; and means for imparting to the table a step-by-step rotation.

FISH CLEANING APPARATUS.—No. 719,235. Jan. 27, 1903. J. Johnson, San Francisco, Cal., assigned to Alaska Packers' Association, a corporation, of San Francisco, Cal. This invention relates to an apparatus designed for the cleaning and dressing of fish, such as salmon preparatory to packing into cans for preservation and shipment. It consists in devices by which the fish is carried through an apparatus with suitable guides and separators, and saws so located and driven with relation to the passing fish as to cut off the fins, devices for splitting, disemboweling, and cleaning out the interior of the fish successively. It is especially designed to carry the fish through the apparatus with the belly downward and to so dispose the splitting cleaning mechanism and brushes with relation to the passing fish that the soft parts removed in the disemboweling process will be delivered downwardly and clear of all the mechanism, which is thus preserved from clogging, and use is made of the force of gravitation in disposing of waste material.

STRUCTURAL METAL SUPPORTS.—No. 719,191. Jan. 27, 1903. T. Collins, San Francisco, Cal. This invention relates to improvements in metal structures used in partitions and ceilings or wherever a support or frame of extreme lightness and thinness is desired with utmost rigidity is needed. It consists essentially of supports or studs angularly slotted, and angle-shaped transverse bars adapted to rest in these slots, the edge of the studs and the vertical faces of the cross bars being in the same plane (the vertical faces of the cross bars may have burrs on them by which metal rubbing may be attached, said studs and bars being rigidly retained in position in relation to each other without the use of rivets, bolts, or clenching devices.)

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JANUARY 27, 1903.

719,181.—CONCENTRATOR.—C. Brown, Bishop, Cal.
719,191.—STRUCTURAL METAL SUPPORT.—T. Collins, S. F.
719,235.—CAN SALTING MACHINE.—W. E. Dement, Blaine, Wash.
719,337.—GEAR.—R. B. Hain, Los Angeles, Cal.
719,345.—GOVERNOR.—R. B. Hain, Los Angeles, Cal.
719,230.—TEMPERATURE RETAINER.—J. Hommel, Los Angeles, Cal.
719,236.—FISH CLEANING APPARATUS.—J. Johnson, S. F.
719,345.—OIL BURNER.—L. H. Lewars, Berkeley, Cal.
719,356.—WATER HEATER.—J. McCartney, S. F.
719,345.—FUSIBLE PLUG.—H. D. Morton, S. F.
719,038.—FLOORS, ETC., CONSTRUCTION.—J. C. Pelton, S. F.
719,373.—GAS GENERATOR.—W. A. Robertson, Alameda, Cal.
719,051.—PLANE.—W. L. Scott, S. F.
719,381.—COMPASS.—H. E. Seymour, S. F.
719,391.—GAS GENERATOR.—E. B. Stoner, Astoria, Or.
719,273.—TREATING ORES.—Z. B. Stuart, Los Angeles, Cal.
719,274.—TREATING ORES.—Z. B. Stuart, Los Angeles, Cal.
719,275.—SPINNING TOY.—J. S. Thornburg, Los Angeles, Cal.
719,089.—SAW HANDLE.—J. A. Williams, Dallas, Or.
719,393.—WELL DRILL.—M. Ziegenfuss, Burns, Or.

Latest Market Reports.

SAN FRANCISCO, Feb. 6, 1903.

METALS.

SILVER.—Per oz., Troy; London, 21½ (standard ounce, 925 fine); New York, bar silver, 47½c, refined (1000 fine); San Francisco, 47½c; Mexican dollars, 38 @ 39c San Francisco, 37½c New York.

COPPER.—New York: Standard, \$11.50; Lake, 1 to 3 casks, \$12.75; carload lots, \$12.00; Electrolytic, 1 to 3 casks, \$12.37; carload lots, \$12.25; Casting, 1 to 3 casks, \$12.25; carload lots, \$11.50. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £56 spot per ton.

Copper is advancing fraction at a time, each week noting an increased price. That it will reach and pass 13 cents, there now seems little doubt, and this increasing price cannot fail to prove a stimulus to the industry generally. There are many mines that cannot be operated profitably on 11 or 12 cent copper, which will pay handsomely at 13 cents and over. The Boston Financial News says: "Those in close touch with the largest selling agency in the country report that bullish sentiments are expressed in that quarter where it is said that the policy pursued a

little over a year ago in reducing copper prices from 17 cents to below 12 cents was based upon a misconception of existing conditions, and that, had prices been held at the 17 cents level but for three months longer than they were, the surplus accumulated during 1900 would have been absorbed by the consuming buyers of 1902, but at the lower levels of 1902. It should be satisfactory to both producer and consumer to know that the accumulations of past years and mistaken policies have no longer an existence."

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½; pig, \$4.75. London: £11 7s 6d per long ton = 2.47c per lb.

SPELTER.—New York, \$4.95; St. Louis, \$4.50; London, £20 7s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 600 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$28 65@28 75; San Francisco, ton lots, 31c; 500 lbs., 31c; 200 lbs., 31½c; less, 32c; bar tin, 3½, 35c @ 37½c. London, £132 10s spot.

PLATINUM.—San Francisco, crude, \$18.00 per oz.; New York, ingot, \$19 00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.50; large lots; London, £8 15s; San Francisco, local, \$45 50 per flask of 76½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.65c.

NICKEL.—New York, 50@60c per lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00; open hearth billets, \$30.00; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS

Bessemer.....	\$24.50@25.00
Foundry Northern 1.....	23.50@24.00
Northern 2.....	23.00@23.50
Northern 3.....	22.50@23.00
Southern 1.....	23.35@24.85
Southern 2.....	22.85@24.35
Southern 3.....	22.35@23.85
Forge.....	21.85@23.35
Charcoal.....	26.00@27.00
Billets, Bessemer.....	33.00@34.00
Bars, iron.....	1.75@1.80
Bars, steel.....	1.75@1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, boiler.....	1.90@2.00
Tank.....	1.75@1.80
Sheets, 26 store.....	2.90@3.00
No. 27.....	3.00@3.10
No. 28.....	3.10@3.20
Angles.....	1.75@
Beams.....	1.75@
Tees.....	1.80@
Zees.....	1.75@
Channels.....	1.75@
Steel melting scrap.....	18.00@18.50
No. 1 railroad wrought.....	18.50@19.00
No. 1 cast, net ton.....	17.50@18.00
Iron rails.....	24.00@25.00
Car wheels.....	23.00@23.50
Cast borings.....	10.25@11.50
Turnings.....	14.00@14.50

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c per lb.; carloads, 24@24½c; in tins, 35c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 2½@3c per lb.; caustic soda, in drums, 3@4c per lb.; Cal. s. soda, bbls., \$1 25@1 50 per 100 lbs.; sks., \$1.05; chloride of potash, 12@13c; nitrate of potash, bbls., 8c; caustic potash, 10c in 40-lb tins; borax concentrated, 7@8c per lb.; roll sulphur, 4@6c; ground sulphur, 4@6c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2 @ 2½c; sulphide of iron, 9c per lb.; copper sulphate, 5@7c; chloride of lime, spot, \$3 00@4 00; sulphuric acid, in carboys, 68% B, 2c per lb.; nitric acid, in carboys, 8c per lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 60%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9c; less than one ton, 11c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c per set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2 50 @ 2 75; Hewmoor, \$2 90; Trowell, \$2.90; Portland, \$2 50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; lots of 5 bbls., 1c less; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24½c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 28½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, No. 1 bbl., \$1.00; cs., \$1.05; Neatsfoot Oil, bbl., 70c; cs., 75c; No. 1 bbl., 55@57½c; cs., 57½@60c; Sperm, crude, 50@60c; Natural White, 55c; Bleached do, 70c; Whale Oil, cs., 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; 1 ton and less than 5 tons, per lb., 6½c; 500 lbs. and less than 1 ton, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, 4c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$3.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

RED LEAD.—One ton and over at one purchase, per lb., 6c; 500 lbs. and less than 1 ton, per lb., 6½c; less than 500 lbs., 7c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb.; powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c per lb.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5@7c.

MANGANESE.—(90% and over) per lb., \$1.25.

MOLYBDENUM.—25c. per gramme; 1000 grammes—2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, per lb., \$1.25.

MERCURY.—Bichloride, per lb., 90c.

PHOSPHORUS.—(American) per lb., \$1.00.

SILVER.—Chloride, per oz., 90c@1.00; nitrate, 55c.

URANIUM.—Oxide, per lb., \$3.50.

ZINC.—Metallic, chemically pure, per lb., 50c; dust, per lb., 10c; sulphate, per lb., 04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from Andrew Custidge in Forty Nine Placer Mine, near Mountain Ranch, Calaveras County, Cal., draining into McKinley Creek which reaches Calaveras River from Frank Vere in Elm Placer Mine, near Quincy, Plumas County, Cal., draining into Taylor Creek which reaches Feather River; from Nelson Contracting Co. in Calaveritas Hill Mine, near Calaveritas Hill, Calaveras County, Cal., draining into Oneil Creek which reaches Calaveras River, gives notice that a meeting will be held at Room 56, Flood Building, San Francisco, Cal., Feb. 9, 1903, at 1:30 P. M.

WANTED POSITION AS MILL SUPERINTENDENT or foreman of an amalgamation and concentration mill; have had 18 years' experience; am a good machinist and understand handling all kinds of machinery; can furnish best of references; at the present time hold the position of superintendent for one of the largest companies in the State of Colorado, but wish to change and will go to any country. Address H. D., care of Mining and Scientific Press.

WISH A POSITION AS ASSAYER, OR STEAM Engineer, or Tool Sharpener, or will act as Superintendent of mines. Jesse L. Wetmore, Hotel Merritt, Oakland, Cal.

MINING AND SCIENTIFIC PRESS

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Number 7.

SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 14, 1903.

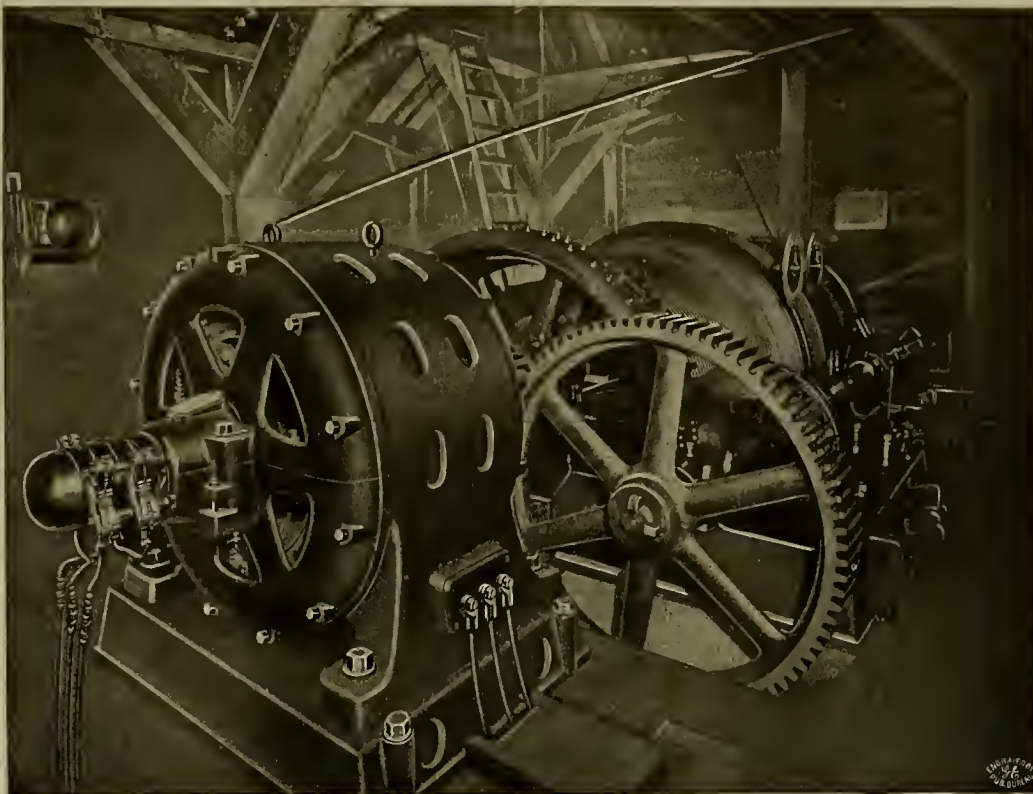
THREE DOLLARS PER ANNUM.
Single Copies, Ten Cents.

Variations in Hoisting Machinery.

There is no kind of mining machinery having so many variations of type as hoisting engines, not only as to size and capacity, but as to detail of construction. This great variation in machines built to perform essentially the same kind of work represents the differing ideas of the numerous different manufacturers, and also, to some extent, the ideas of their patrons. Some favor geared hoists, believing them to be the only safe and reliable machine for the purpose. Others want the friction hoist, as the geared hoist is "too noisy." A third class want direct-acting machines, and hoists of this type are usually preferred in large installations, where the workings extend to great depth. There is much difference in the several arrangements of all hoisting engines, and mine managers have positive but differing ideas as to brakes and the method of their application.

Some require hoists which may be operated by either steam or air; still others have their hoists built for steam and water power, being made quickly interchangeable.

The latest type of hoisting machinery introduced is the electric, and in these is also found a great variety of design. This is largely due in this latter class of hoisting machine to the greatly varying conditions at mines, and even at the same mine the load particularly is greatly variable, and manufacturers of electric machinery for mines have given much attention to the construction of a hoisting machine that will satisfactorily meet the varied requirements. On this page are three engravings from the catalogue of the General Electric Co. of Schenectady, New York, of large electric hoists, located in widely separated parts of the country. One is that at Le Roi mine, Rossland, B. C., a large double reel machine operated with induction motor, built by the Denver, Colo., Engineering Works. Another is that of a Lidgerwood double reel hoist, also run with induction motor, at the Cochiti mine, Albemarle, N. M. The third represents the electric hoist at the Union mine, on the Comstock lode, Virginia City, Nev. This hoist, built by the Risdon Iron Works of San Francisco, Cal., is of peculiar construction, being made to operate a continuous rope. The rope is wrapped four times around an idler, to secure necessary friction for lifting. From the main driving reel the rope is carried over a head sheave and down one compartment of the shaft, under a tail sheave and up the adjoining compartment of the shaft, where it passes over a second head sheave and onto the driving drum. One cage is secured between the



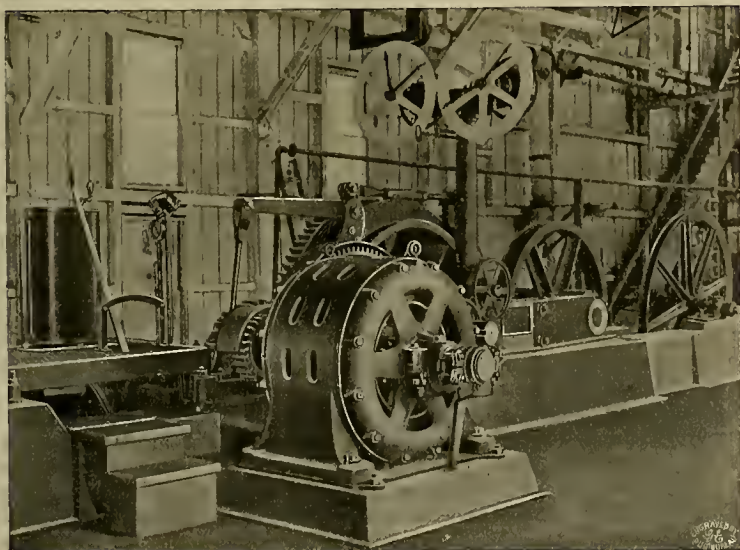
Double Drum Hoist With Induction Motor, at Le Roi Mine, B. C., Built by Denver Eng. Works, Denver, Colo.

ends of the rope, and the other cage is fastened by means of heavy iron clamps, one above and the other below the cage, in the opposite compartment of the shaft.

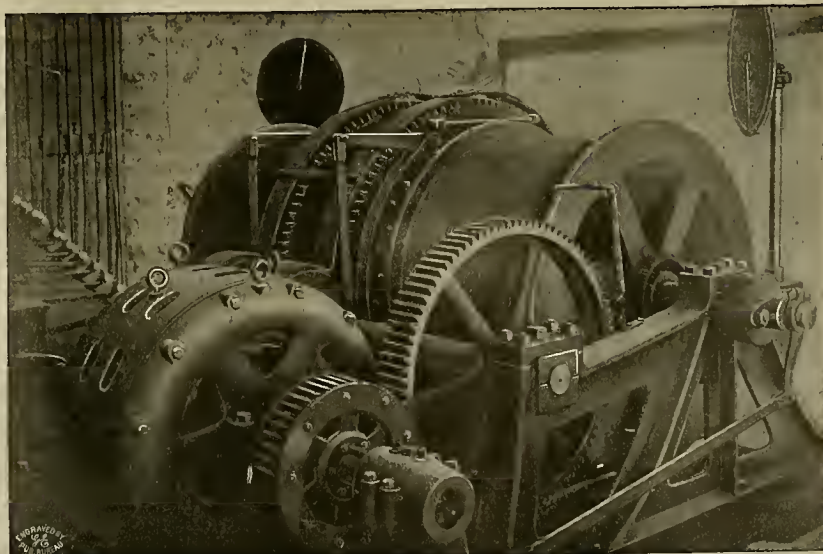
THE work of the United States hydrographic division of the Geological Survey is continued under direction of F. H. Newell. The report for 1901, recently issued, contains valuable data and the result of the work already done in various parts of the country. The work of this branch of the Survey consists in measuring the volume of water in streams and estimating the flow both over and under ground. In this not only the quantity but the quality of the water is determined, and particular attention is given to water conservation. Mr. Newell says: "Water can not be considered a resource unless it can be made available when wanted, and, therefore, the determination of the practicability of holding the waters in time of flood until time of drought underlies

any statement of water supply." The work on water supply has been in progress since 1888 and much valuable work has been done by the Survey.

THE public spirited men of British Columbia have recently organized for the promotion and fostering of the mining industry in that province under the name of the Provincial Mining Association. Mine owners, superintendents and working miners are eligible to membership, as also are merchants, farmers and all others who are directly or indirectly interested in the development of the mineral resources of that section. The specific purpose is to bring about an improvement in conditions; to influence legislation in the interest of the mining industry, and to generally place mining on a more secure and satisfactory footing. Organizations of this character can accomplish much good work in behalf of the mining industry, and that in British Columbia will no doubt make its influence felt.



Electric Hoist at Comstock, Virginia City, Nev.



Double Drum Lidgerwood Hoist With Induction Motor, at Cochiti Mine, Albemarle, New Mexico.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page
Double Drum Hoist With Induction Motor, at Le Roi Mine, B. C., Built by Denver Eng. Works, Denver, Colo.....	97
Electric Hoist at Comstock, Virginia City, Nev.....	97
Double Drum Lidswood Hoist, With Induction Motor, at Co-chute Mine, Albemarle, New Mex.....	97
The Zinc and Fluor Spar Mines of Kentucky.....	101
Sketch Showing Construction of Collar on Sluice Box Joints.....	102
Silver Mining and Smelting in Mongolia.....	103
Map of Southern California, Showing Progress of Topographic Surveying.....	104-105
Minlog and Metallurgical Patents.....	106
EDITORIAL:	
Variations in Hoisting Machinery.....	97
The Hydrographic Survey.....	97
Promotion of the Mining Industry in British Columbia.....	97
"Flashlog" of Fuel Oil.....	98
Estimating the Value of a Gold Mine.....	98
A Partial Solution of the Mine Trouble in the Transvaal.....	98
A Valuable Mine Report.....	98
The Expense of Deep Mining.....	98
MINING SUMMARY.....	107-108-109-110-111
LATEST MARKET REPORTS.....	112
MISCELLANEOUS:	
Concentrates.....	99
Stamp Milling and Amalgamation of Free Gold Ores.....	100
Zinc Ore Concentration at the Payne Mine.....	100
The Fluor Spar and Zinc Mines of Kentucky and Illinois.....	101
The Breakage of Stamp Stems.....	102
Hydraulic Mining in California.....	102
How to Treat a Belt.....	102
Silver Mining and Smelting in Mongolia.....	103
Rules for Computing Maximum Revolutions for Flywheels.....	103
A Correction.....	103
Formation of Gold Nuggets.....	103
Production of Almaden, Spain, Mines.....	103
The Globe Copper District, Arizona.....	104
Progress of the United States Survey.....	104
Discovery of Mineral in Place.....	104
"Formation of Nuggets".....	105
The Flow of Water in Open Channels.....	105
Mining and Metallurgical Patents.....	106
Obituary.....	111
Personal.....	111
Commercial Paragraphs.....	111
Books Received.....	112
Catalogues Received.....	112
Notices of Recent Patents.....	112
New Patents.....	112

THE best thing the California Legislature can do with the "flashing" of fuel oil is to let the whole subject alone. The matter may not be beyond its comprehension, but it is apparently beyond its jurisdiction. It is in order for the California legislators to make adequate appropriation for suitable display of California's mineral wealth at the coming St. Louis Exposition, and to see that whoever are sent to represent the State and disburse the money shall have some knowledge of the requirements of the situation.

IN estimating the value of a gold mine, where it is evident several years, possibly a score of them, will be required to exhaust the available resources, there is one factor which may be entirely eliminated—that of the value of the product. Gold does not fluctuate in value, being itself the standard of values. The cost of working the mine may increase or decrease with the coming years, as conditions change, but the price of gold remains stationary through these numerous changes of condition and value in other things.

A PARTIAL solution of the labor problem in the mines of the Transvaal seems to have been found by the labor agents of the companies who are in Europe. It is stated that 6000 Italians have been enlisted at a wage rate but little above that demanded by Chinese. It is also reported that large numbers of workers will be secured in South Russia. Cheap European labor has been introduced into the mines of the United States, but experience has shown that these men, willing at first to labor for a mere pittance, as soon as they become proficient in their work demand about as much for their services as Americans or other experienced miners.

A Valuable Mine Report.

The ninth annual (1902) report of the Portland Gold Mining Co. of Cripple Creek, Colo., recently issued, is one of the most complete that has ever been published by any mining company of that State. It contains numerous illustrations and maps, with sectional drawings of the geology and mine workings. These latter not only give general information, but in many cases give details of the geological occurrences of particular portions of the veins, such as are not often found outside of papers published by technical societies.

The report goes into the problems of mining encountered and gives some valuable information applicable particularly to the Cripple Creek district. Here the problem of getting the best results from veins of the character found in the district is one of hand concentrating. Owing to the physical condition of the ore, mechanical concentration is unsatisfactory. The important question has been where the hand sorting should be done—under ground or on the surface—and it has been found advisable in some cases to perform the first stage of this operation in the stopes, and the second on the surface. Under the conditions existing in the district it has been found that the cost of getting the material out of the chutes, teaming, hoisting, sorting in the ore houses and teaming to the waste dumps, is greater than stoping of ore and timbering. Here the "fines" constitute the most valuable portion of the ore, and this renders underground sorting as now practiced, and filling with the waste, inadvisable, and in some cases prohibitory, owing to the loss in the fines, which are the richest portion of the ore. Where filling is imperative, owing to great size of stopes, mining has been accomplished by spreading canvas on the floor of the stope, covering it with a plank floor, over which the heavy lagging is laid to protect the floor and canvas from blasting. In this manner, although involving extraordinary expense, a large percentage of the high-grade fines is recovered and the stopes are filled with waste. This latter plan has not been in operation long enough to demonstrate its relative economy. The fact that this method is more expensive is against its adoption, but a choice between this method and that of hoisting all the ore and sorting at the surface will be made. By the latter cheaper method a larger volume of material results, but it is much lower in grade than that obtained by the former plan of underground sorting. When transportation and treatment charges on the resulting larger volume of ore is taken into consideration, it may be found that there is little difference in cost per ounce of gold produced. Still it is not desirable to leave valuable material in the mine which could as well come out.

It is not improbable that some variations of the underground method of sorting will be the outcome of this necessity by which the expense may be materially reduced, while recovering practically all the ore of value.

Possibly the introduction of grizzlies constructed of movable timbers on the floors of the stopes may prove an advantage in dealing with this proposition. These may be moved at will and replaced on a higher floor. By this method the large rocks are prevented from falling into the ore pockets below and clogging the chutes. The fines produced by blasting pass through, and all of the subsequent spalling and sorting by hand may be accomplished on these grated floors, the valuable material passing below to the chutes, from which it may be removed, the coarse waste to then be sent out in the same manner, after the ore has been drawn off, or it may be stowed in the stopes.

Grizzlies of this description are in use in the Gwin mine, Calaveras county, Cal., and are employed to facilitate breaking coarse ore before permitting it to descend into the chutes. In the narrow stopes of the Portland mine all the ore broken is raised to the surface. In some of these veins the ore is mined "on the run." That is, the ore is broken from wall to wall, and as the stope progresses upward the ore is drawn only in such amount as will keep the floor within convenient distance of the hack. When the stope has all been broken down the ore remaining is all drawn out and the walls allowed to cave.

The economy of self dumping skips over cages has

been recognized and these have been introduced to lessen the cost of hoisting. They are run in balance. By the use of skips the hoisting capacity of the shaft is increased and topmen are reduced in number.

The report shows that during the first six months of the year 162 857 tons of ore were mined at a cost for mining of \$3 26 per ton, and during the second half of the year 148 997 tons were mined at an expense for mining of \$2 97 per ton. During the year 15,173½ feet of development was done at a cost of \$161,300.60, of which \$33,703.73 was charged to stoping, making the cost of dead work \$122 596 87. The total cost of operating amounted to \$1,067,738 93, the cost per ton being \$9 508. The mine produced 116,701.19 ounces of gold, valued at \$2,334,023 76. The actual expenditures, however, on all accounts were \$1,875,296 96 and the net profit over all expenses was \$471,819 76. The various departments of expense are segregated as follows: Breaking ore includes the cost of breaking ore in stopes and delivering it to trammers; this includes the labor of miners, machine men and shovelers, cost of explosives, running machines, etc. Trimming comprises the cost of taking ore from the chutes and delivering it at the shaft, including the labor of trammers, cost of tracks, repairs on cars, etc. Timbering comprises the cost of timbering the stopes in labor and supplies. Hoisting comprehends the cost of raising ore to the surface, including the cost of steam, labor and repairs in operating the hoists, repairs to shafts and labor of cagers and topmen in putting cars on cages and taking them off. Sorting and loading includes the cost of concentrating ore by hand labor in the ore houses, loading it on cars and shipping it; also, cost of repairs in ore houses. Pumping is the cost of draining the mine.

Development charged to stoping: This is the cost of all exploring work that produced any ore. In the second half of the year the proportion of ore produced was greater than the first half, making a difference in the cost per ton.

These are the principal charges. Others are chiefly on account of office and other extraneous expense, interest on equipment, insurance, etc. The total cost per ton was about \$9.25, or about \$8.10 per ounce of gold produced.

The Expense of Deep Mining.

As the workings of a mine extend to greater depths, the cost of operation is naturally supposed to increase. The main factors in increasing the expense are greater power required for hoisting, drainage of mine workings and ventilation, with a greater consequent outlay in machinery, which means increased interest charge on account of equipment. There are other factors which are given consideration when mining to great depths is in contemplation, these being the encountering of large volumes of water and increase in temperature to an abnormal degree. These are merely problematical, as the deep workings may not prove to be materially hotter or wetter than those nearer the surface, and in practice it frequently occurs that there is no considerable increase in heat, and the amount of water found is actually far less than is encountered in the upper levels. As a matter of fact, many mines working at great depth actually mine and treat their ore at a lower cost per ton than had been done in the upper workings, this being made possible by the thoroughly systematic development of the mine and improved methods in operating. The heavier and costlier machinery has a far greater efficiency, and much larger quantities of ore and materials can be handled at proportionally less expense. In many mining regions the mines operating below 2500 feet are doing so at a less cost per ton than that obtaining at higher levels in the earlier history of the mine. Where new enterprises are obliged to sink deep vertical shafts to reach their veins, as is the case at some of the copper mines of the Lake Superior region, on the Rand, in South Africa, and elsewhere, several years are required for preliminary work and the consequent expenditure of a large amount of money without return, but the managers of such enterprises should be able to get an approximate idea of the expense from the operations of companies already working at the depth which it is proposed to reach and prepare to discount it.

CONCENTRATES.

"MAN ENGINES" are not in use in American mines. They originated in Cornish tin mines.

THE cyanide process has been successfully applied in the extraction of gold from auriferous arsenical sulphide ores.

CASSITERITE (tin oxide) is usually associated with granite or rocks of granitic type. It contains when pure 78.76% tin and 21.24% oxygen.

WHERE two veins unite on their dip to form one vein the prior locator is entitled to take all that lies below, including the place of intersection.

THE lightest of metals is lithium, specific gravity, 0.59. It is the only known element with which nitrogen will directly combine at ordinary temperature.

SIDERITE (carbonate of iron) occurs in the Payne mine at Sandon, B. C., which is naturally magnetic, a very unusual property in this mineral before roasting.

ARSENIC occurs abundantly in the free state in some localities, but is usually combined with some other element, particularly iron and sulphur. Cobalt and arsenic are frequently associated.

QUARTZ PORPHYRY is often associated with or contains bodies of copper ore, but so do other rocks as well. Limestone is not an accompaniment of all large copper mines, though prominent in Arizona.

THE pulverized mineral from Santa Ana, Cal., is apparently fine volcanic ash, either naturally or artificially pulverized. Except, possibly, as a polishing material for rough work, it has no commercial value.

THE slope angle of most hillsides is less than 30°, and very few exceed 35° unless they be abrupt precipices. The normal slope angle of a dump is about 35° and varies little from this no matter what the material.

THE silver found in some of the copper mines of the Lake Superior region is native metal and is not alloyed with the copper, nor does the copper contain a trace of silver. Often the silver is associated with calc spar.

HYDRAULIC MINING is of common practice elsewhere than in California. In Augusta county, Georgia, at the Crinora mine, which yields only manganese ore, it is sluiced out as in hydraulic treatment of gold gravel.

PROOF that \$500 worth of work has been performed on a mining claim must be supplied by the applicant for patent. Such proofs should be specific, and establish all the facts which are required by the deputy mineral surveyor.

ANY inhabitant of Mexico may prospect for mineral on the public lands by first giving notice in duplicate to the local government mining agent. The notice must state accurately the boundaries of the territory to be prospected.

THE appearance of copper carbonate incrusting surface rocks is not always a safe indication that a valuable ore deposit lies below. Nor is an iron gossan, even in a region producing copper, an infallible index of copper value in depth.

EXPERIMENTS to redetermine the density of the earth are to be made in the Tamarack shaft, near Houghton, Mich., by F. M. McNair of the Michigan College of Mines and J. E. Hayford of the United States Coast and Geodetic Survey.

THE laws of California do not require hoisting engineers to have a certificate, but the engineer who cannot remember the hell signals long enough to comply with directions from below is a dangerous man and should be employed elsewhere.

CHERT in limestone sometimes contains gold in paying quantity, though it is unusual. In the Pocahontas mine in Squaw Creek canyon, about 12 miles west of Deadwood, South Dakota, rock of this description was found containing about \$3000 per ton in free gold.

In refining copper from a sulphate solution, one kilowatt hour at a potential difference of 0.5 volt will produce 2.36 kilos of copper. From a chloride solution working at the same potential difference (0.5 volt) 4.72 kilos of copper are produced by one kilowatt hour.

SILVER CYANIDE is very similar in its properties to chloride, iodide and bromide of silver. It is obtainable by adding a solution of hydrocyanic acid to silver nitrate. It is soluble in a solution of potassium cyanide, from which crystals of silver cyanide may be obtained by evaporation.

THE government of Uruguay, South America, gets a percentage of all gold produced. In mining, French

machinery and appliances are exclusively used. There are no mines of copper, gold or silver in Paraguay, South America. Copper is found, but has never been developed.

WHERE prompt filling with waste of mine workings is practiced, timbers of moderate dimensions may be employed. Where this has been done experience has shown that timbers of large size are unnecessary, though they will support the ground a longer time without filling than smaller timbers.

THE base of the ore from Azusa, Los Angeles county, Cal., is baryta (heavy spar). The pink mineral is erythrite, a hydrous cobalt arsenate (also called cobalt and peach bloom). The black, soft mineral is silver sulphide. A small quantity of native silver may also be seen in the specimen.

MINING PROPERTY in Mexico legally acquired is irrevocable and perpetual as long as the Federal tax upon the property is paid. Water raised to the surface from the mine workings is the property of the mine owner, but he becomes responsible for any damage done by the water flowing over the property of others.

THE electrolytic method is coming to be the general way of copper determination. It were well if some standard method could be agreed upon for gold and silver assaying. Different methods give different results, and disputes can usually be obviated by mutual agreement in individual contracts as to what method of assay shall be adopted.

MICA of good quality and in sheets larger than 4 inches square meets with ready sale. Nearly every large electrical company is in the market. The Idaho specimen is muscovite; the Shasta county, Cal., sample is of inferior grade. A. Seboonmacher or E. Munsell, New York City, are dealers in mica. In 1901 mica was imported into this country to the value of \$335,054.

In a copper sulphate solution of about 50 c.c., containing not less than 0.0128 gram of CuO, the copper may be completely precipitated as oxalate by adding oxalic acid. The copper is precipitated all the more easily in the presence of a moderate quantity of nitric acid, about 5 c.c. of the concentrated acid. Under these conditions, cadmium, arsenic, iron, small quantities of tin, but not zinc, remain in solution.

THE dark-colored zinc blende usually contains iron and manganese. When pure this mineral is nearly colorless and transparent. One locality in New Jersey produces specimens that are white. Most commonly it is light brown to yellowish. When associated with galena it often has a sub-metallic luster and is sometimes mistaken for the former. When treated with sulphuric acid sulphuretted hydrogen is evolved.

FULLER'S EARTH may be tested by its physical properties to a certain extent, but an analysis is most satisfactory. It is usually light gray, yellowish or greenish yellow to light brown in color, has a somewhat greasy feel, is earthy and soft with a greasy streak; it does not adhere to the tongue. Placed in water, it absorbs a large volume of the water, cracks and falls into powder, but is not plastic, and cannot be moulded.

By "yellow copper ore" is meant the common copper-iron sulphide (chalcocopyrite). It contains sulphur 35%, copper 34.5% and iron 30.5%. To meet this formula, the mineral must be pure. The copper content frequently falls below the percentage stated owing to a mechanical admixture of iron pyrite which may or may not be visible to the eye. For this reason a mineral supposed to be pure chalcocopyrite often contains less than 20% copper.

A GOOD WAY to guard against a mining or milling failure is to get competent ore examination by one who can correctly determine its necessary treatment. With sufficient ore to justify the expense, the plant requisite should be bought from men able to furnish a good quality of machinery throughout. All this will cost considerable more at the start than not to do it, but if the intent be to work the mine, the plan suggested will prove of ultimate economy.

WHENEVER a dispute arises as to the right of a claim owner to follow a vein on its dip beyond the side lines of a claim the defendant must establish the apex of his vein on the surface, and prove its continuity and identity from the apex to the point of dispute. It is not necessary that the apex of the vein extend through both end lines of the claim, or through either of them, so long as sufficient of the vein is exposed in the apex to give the privilege of extralateral right.

"CHICKEN LADDERS" is a colloquial term applied to the notched poles used in many mines, and particularly in Spanish-speaking countries, as a means of ascent and descent in the workings. The native miners of Mexico and some of the Central and South American States climb these notched poles through hundreds of feet of mine workings, carrying heavy burdens of ore in leather sacks on their backs. In some countries notches are cut in the rock of the footwall for a similar purpose.

It is a mistake to consider as proved any comparison

of costs by some other mine similarly situated. Every mine is a separate and distinct problem of itself. Seldom can the same costs be figured in precisely the same work in two different mining properties. There is always just enough difference in some one item—the extraction of ore, or the water, or the stamps, or the plates, or something—to upset any calculation that because the costs in one mine were so and so they will be the same in another precisely similar property.

OIL for a gas engine may well be of two kinds—a heavy, viscous, mineral oil of high fire test for the cylinder, and a good quality of engine oil for the bearings. The best oil is none too good; with too little oil there is greater wear on the working parts, greater consumption of water, more frequent needed cleaning of packing rings and greater fuel consumption, because of greater friction. With too much oil there is a general stickiness, and often a clogged mixing valve. The best oil in moderate quantity insures the best results.

GABBRO is a basic rock, wholly crystalline, with granitic structure. It is composed chiefly of diorite (a peculiar, lamellated or foliated pyroxene), and plagioclase with magnetite, titanite, apatite and olivine. It occurs in masses, dikes and sheets. There are several varieties named according to the presence of certain minerals not essential constituents, as hypersthene-gabbro, hornblende-gabbro, mica-gabbro, orthoclase-gabbro, olivine-gabbro, etc. It is abundant in some regions where basic rocks predominate. In California it is often associated with serpentine.

THE separation of zinc from the complex sulphide ores of zinc, iron, lead and copper, which have always defied every attempt, seems now to have been satisfactorily accomplished by various forms of electro-magnetic separators. There are hundreds of thousands of tons of ore of this character lying on mine dumps, where it has been deposited because it could not be handled to profit. In Colorado they may frequently be seen, and at the Broken Hill mines of New South Wales ore of this character has been accumulating from the extensive operations there for years.

THE fact that an ore body extends underground beyond the end lines of a claim, though not so appearing on the surface, does not permit the owner of the exposed outcrop to go beyond his end lines. Most ore shoots have a trend along the strike of the vein, the direction of which it is sometimes difficult to determine until a large amount of development has been done. The direction of trend as indicated at and near the surface is not always constant below. A distinction must be made between dip of the vein and trend of the ore shoot, along the course of the vein.

WORK done outside of a claim or group of claims, if done for the purpose and as a means of prospecting or developing the claim, as in the case of tunnels, drifts, etc., is available as assessment work, the same as if done on the claim itself. Where there are more than one claim in the group, \$100 worth of work must be performed for each claim of the group. In the same manner, where the work is all done on a single location for the benefit of all the claims in the group, this work may be applied as assessment work on all, \$100 being expended for each claim of the group.

THE American Institute of Mining Engineers had on Nov. 1, 1902—the date of the last official report—a total membership of 3262—honorary members, 11; members, 3094; associates, 157. The rules of the Institute establish the following as the essential qualifications for eligibility to membership: "Members and honorary members shall be professional mining engineers, geologists, metallurgists or chemists, or persons actually engaged in mining, metallurgy or metallurgical engineering. Associates shall include all persons desirous of being connected with the Institute, and duly elected."

MISPICKEL, the sulpharsenide of iron, is not uncommon in quartz veins. It is somewhat softer than pyrite, is tin white to steel gray, often tarnished. It pulverizes to a dark grayish powder, and is often auriferous. It is decomposed by nitric acid and when auriferous the gold may be recovered in this way. Though sometimes very rich in gold, it is often barren of that metal. It is an ore often difficult to handle and large sums have been spent in futile attempts to amalgamate a high percentage of the gold present. When the mineral also contains cobalt (replacing part of the iron) it is known as danaite.

THE Kearns senatorial amendment proposes that the United States mining law shall be changed so that mining locations shall be rectangular in form, not to exceed 1500x1500 feet, and shall convey "the right of possession and enjoyment of all surface included in the lines of the location, and of all veins, lodes, ledges and mineral deposits throughout their entire depth, which lie within such surface lines extended downward vertically." That is, there would be no following of the vein on the dip, no "extralateral rights." The bill was published in full and editorially discussed by this journal last summer. It comes up for discussion in this session of Congress. From our standpoint it should become a law, as it would help the prospector and miner and discourage the expensive litigation that has been the bane of every mining camp in the country.

Stamp Milling and Amalgamation of Free Gold Ores.

NUMBER V.

Written for the MINING AND SCIENTIFIC PRESS by DANA HARMON, San Francisco, Cal.

It has also been said that fragile sulphurets are badly abraided by the wide plate flow and that therefore the sluice should be used. In other words, the wide plate increases sliming and the 20-inch sluice avoids it.

Put your hand into any narrow sluice and you will find the sand and sulphurets trailing along on the bottom. Fragile sulphurets are not any worse off upon a wide plate than in a narrow sluice.

But they are not so fragile; they stand quite a bit of cuffing. By way of illustration on this point, examine the mill records of Black Hawk canyon, in Gilpin county, Colo. Here are sulphurets pulverized minutely through 50-mesh screens, in deep mortars. I am not defending this Gilpin county method of milling. But it did well serve its special purpose and solved a baffling problem in the early '70s. The mill saving, including the values in the concentrates, was 93.8% of the gold and 71% of the silver on ores worth approximately \$42 per ton. By amalgamation alone the saving was 70.4% of the gold and 39.7% of the silver. This was on a lot said to be typical of the camp. I am quoting from T. A. Rickard's admirable book, "Stamp Milling of Gold Ores." To facilitate further comparison, let me quote his following figures on these Gilpin county ores:

Weight of stamp, 550 pounds.
Height of drop, 16 to 18 inches.
Discharge, 13 to 15 inches.
Drops per minute, 26 to 30.
Screens, No. 1½ hurr slot (50-mesh).
Crushing per stamp, one ton in twenty-four hours.
Concentrates, 12% to 20%.
Tables, 4 feet wide by 12 feet long on 2½-inch per foot grade."

I am inclined to think that if some one will discover another Black Hawk canyon, the Gilpin county stamp mill will not be the method used to recover the gold. But the mill did prove that sulphurets can be concentrated after being so finely ground that 70% of the pulp would pass a 100-mesh screen, and all of it through 50 mesh. One need not worry over fancied plate abrasion. We have had the same proofs at other districts.

DON'T ADD WATER OUTSIDE THE MORTAR—I think one needs just the same amount of water inside the mortar as out, and there is no better guide as to how much water to use in the mortar than to use just enough as will move the pulp properly over the plates. No reliance can be placed upon stated formulae of so many gallons per ton of ore.

The quantity of water is vital, and, so far as my observation has gone, nine millmen in ten use too much. Not one of these nine will agree with me in this—which only shows how obstinate men can be.

One reason for the excessive use of water, so common, is that the table has too little grade.

The millwright turns over a table 1½-inch to 1½-inch grade to the foot. It should be 2½-inch to 3 inches.

Don't be afraid of steep grades, for it means less water and clean table; no danger of scour.

DISTRIBUTING BOXES.—These are an abomination. The holes get plugged up; they incite the millman to careless use of quicksilver when rubbing up; they are traps to gather quicksilver, and let it out in lumps on the plates; they don't distribute pulp as evenly as the splash boards. (Fig. 2)

Globules of free quicksilver on the plates should never be tolerated. If there is a distributing box, the millman can lay the blame to the box. Take away the box and roh him of his excuse.

DON'T TURN ALL THE PULP ON HALF THE PLATE AREA WHEN BRUSHING UP.—We have seen the 4-foot plate with partition strip in center and distributing launder at the head. The battery is not hung up when brushing the plates, but all the pulp is turned to one side of the strip, while the men are working on the opposite side.

There can be no logical defense for this custom. If 4 feet width is needed at any moment, it is for all the moments. To confine all the flow to 2 feet width must inevitably scour. The only excuse urged is that it does not pay to hang up. I hardly think it pays any better to scour—the richer the ore the greater the loss. Build another battery if the mine will stand it. The average mine will survive the shock of a little hanging up.

The champions of the never-hang-up theory seldom, if ever, sample tailings when brushing up. They don't know their own losses. It is a well-known fact that upon ore of only \$8 value the plate just before brushing up will be plentifully sprinkled with coarse bits of amalgam. I suggest, by way of proof, that three tailings samples be taken from the 4-foot plate width within the ten minutes preceding the rubbing up, and then three samples from the 2-foot plate width during the ten minutes of rubbing up. Do this for thirty days, making careful assays of all the sam-

ples. Note the per cent of assays abnormally high due to particles of amalgam.

It is not sufficient to reply that what is lost in amalgam is recovered in the concentrates.

Every concentrator passes more or less of amalgam and mercury over into the tail race.

Don't scrape main plates with chisels.

No globules of free quicksilver on plates.

It is essential to keep a well-silvered surface, sticky and pasty. The apron plate may require replating every three or four months. The lower plates should wear several years. The cost of replating varies with the ore. I have found it amounts to 1 to 1½ cent per ton crushed, using a plating of three ounces silver per square foot of plate on copper weighing five pounds per square foot.

Take off every morning the excess of amalgam, but never skin it closely. I am sure this is a better method than to let the amalgam accumulate to the close of the run. This applies to all except the lip plate. Rub up with a piece of coarse cotton domestic several folds thick, sprinkling the plate with quick from a small shaking bottle. I have seen used a beer bottle with quill through the cork; but this is malpractice. Use a small vaseline jar with a piece of cotton tied taut over the mouth, and have clear, tepid water in a kettle to dip the rag in frequently. Rub the plate briskly and thoroughly, being careful every day to remove all blisters of amalgam. These blisters eat out the silver, and therefore should not be permitted to form. In cold weather they are especially troublesome. If they stick too tight for the rag, they may be gently scraped off with a piece of No. 24 stovepipe iron shaped like a flat scoop 2 inches wide. Do not use a steel chisel. Finish with a final light sprinkling from the jar and thorough rubbing with the cotton rag, then brush over with a whisk broom.

The lip plates are never softened with quicksilver, but are every morning brushed off, or, rather, scrubbed off with the broom, to clean out the sulphurets. The lips will stand a good stiff brushing daily. A 17-inch wide lip plate, plus the splash plate over it, ought to catch about one-third of all the gold recovered outside of the mortar.

At 4 o'clock p. m. and at midnight my plates are again rubbed up, but no amalgam is taken off at these times. It therefore takes only a few moments for these two rubbings. I find that the running time on a 30-stamp mill is twenty-three hours daily because of this careful plate treatment. On heavily sulphuretted ores more frequent brushing up will be necessary.

There are never any globules of free quicksilver on the plates, top or bottom. If the ore is lean, feed less in the battery, and the rubbing up is so carefully done that it never leaves drops of quicksilver on the plates.

The quicksilver fed is weighed at every shift in troy ounces and a daily record kept. Never weigh out an allowance to a millman. They know what is expected and careless work reveals itself immediately on a plate. At clean-up there should be little or no free quicksilver in the mortars around the dies.

Battery water at 55° Fahr. will give good results; 65° to 70° is preferable and high enough. It is essential not to have sudden changes. I never saw a reliable mechanical heater. Perhaps, where oil is cheap, and an even heat can be had under the boiler, it would be possible to keep the temperature uniform in a battery feed tank.

I rely upon keeping the plate room warm because I am afraid of the sloughing off of amalgam, which inevitably follows a sudden rise of 20° to 30° of the water. The automatic stoker of wood or coal must be something that does not wear pants. All the mill hands I have tried fire irregularly.

AUTOMATIC SAMPLING.—The custom of sampling tailings with a dipper by hand every half hour, more or less, has but little to commend it.

It is to the owner's interest to know exactly what the tailings assay. It is to the millman's interest to keep the tailings low.

The hand sampler will soon learn how to sample judiciously from his point of view.

Nobody can coach an automatic sampler driven by machinery.

It is absurd to take off the sample by hand from the tail of the vanner.

There are several kinds of excellent automatic samplers in use which I will not take space to describe. However the sample he taken, it should be evaporated to dryness for the assayer. Do not pour off the clear water; you may use a siphon on the excess clear water.

CLEAN-UP APPARATUS.—To clean up I use: A wooden trough 5x2x2 feet; a man with the hoe; a 49 rocker 4 feet long by 16 inches wide; a clean-up board 5 feet long by 12 inches wide, with 3-inch side rails, covered with a silver plate; a Buck and a wedgewood mortar; a small iron screen ½-inch mesh.

Into the trough throw all the mortar dirt; sprinkle freely with quicksilver; turn in boiling hot water; then hoe the mass about thoroughly with hoe and strong four-tined rake or pick, so as to break up all lumps. The dirt is then rocked out and the resultant amalgam, iron scraps and fine sands dumped upon the clean-up board and the sand washed out with a hose stream. The iron is taken out by magnet. Grind

the amalgam a few minutes in the Buck mortar; rewash on the board, giving a final bath of quicksilver in a wedgewood mortar to skim off the dross. Don't omit this bath, especially where you sell the "sponge gold." If retorting is followed by melting, the bath is not essential. To make sure there are no lumps or bits of iron, copper or brass, strain through the ½-inch screen and regrind the lumps. Squeeze the amalgam into balls through stout domestic or twilling. Chamois skin is too expensive for this purpose.

I venture the assertion that by this process two men will in two hours clean up a 20-stamp mill and leave not over \$50 in the sands.

These sands are, of course, put back in the hatteries at the following run.

I would clean up a 100 or a 500-stamp mill by the same process, except that the mixing would be done by what the macadamizing men call a "rattler" or revolving trommel. Rattler and rocker to be driven by power.

Clean-up barrels and pans flour quicksilver and thereby entail unnecessary losses of gold.

The clean-up room should have a cement floor. All wash water should pass into settling boxes or tanks.

It is not good practice to work down the headings from several mortars in one. It is better to dump all the headings from each battery into the clean-up trough.

Before hanging up the battery the pulp in it should be run down by dropping the stamps slowly. As fast as the stamps begin to bounce on the die hang them up. Whether the dies and mortar liners are removed at every clean-up will depend partly upon the grade of the ore and partly upon how hard up you are.

At the Empire mill, in Grass Valley, Cal., there is an admirable cast-iron clean-up howl, set on an angle and slowly driven by a power belt. A small cannon ball is laid in the howl and the dirty amalgam thrown in. With a constant stream of water running in, the amalgam is quickly cleaned. Trap and other strippings and sweepings are also handled by this howl.

(TO BE CONTINUED)

Zinc Ore Concentration at the Payne Mine.

TO THE EDITOR:—The Payne mine, which for ten years has been a heavy producer of high-grade argentiferous lead ore, and has paid in dividends over \$1,500,000, is now producing argentiferous zinc blende, which is recovered as a by-product in our 200 ton silver-lead concentrator at the rate of 20 tons per day (twenty-four hours) and averages 45% zinc, with 15 to 20 ounces in silver. I am at present shipping this product to the Lanyon Zinc Co. at Iola, Kan., under a freight rate of \$11 per ton, but within a month or two I will have our new magnetic separating plant completed, which will enable us to make a 60% or 70% zinc blende with 16 to 20 ounces of silver values per ton and only 2% lead and 3% iron. One particularly interesting feature about our zinc is that the iron associated with it is a carbonate or magnetic spathic iron, which is readily separated from the blende by magnets, even without preliminary roasting, in which respect it surpasses the Joplin and Colorado ores. We have in the Payne mine sufficient ore on hand—partly blocked out at lower levels and partly contained in the old stopes as a filling material—to keep our concentrator supplied for more than two years. Besides its silver-lead values this large quantity of ore will average from 16% to 20% in zinc, of which at least 80% can be saved by jigs and Wilfley tables. Until about a year ago no efforts had been made to recover this valuable mineral and the old stope fillings and waste dumps are, therefore, full of zinc concentrating material, mixed with galena and silver values, and you will readily see the great future before the property when 20 or 25 tons is produced daily as a mere by-product in the mill.

Similar conditions exist in several other properties of the camp and throughout the Slocan rich deposits of zinc have been known for several years, but it is only at a recent date that the actual market value of these ores has been discovered, a fact which reminds one of the history of Leadville and Creede camps, where zinc values were discovered after the slump in silver a number of years ago. The Slocan has for the past three years been "up against it." Not alone has silver declined beyond all expectations, but lead, which is sold to local smelters per London quotation, less \$1 per 100 pounds, reached a point where it had to be mined at a loss for the sake of its high silver values. Only a few of the high-grade properties have, therefore, been able to operate. Out of nineteen concentrators in the district the Payne in Sandon and Highland at Ainsworth are at present the only plants running steadily. With the prospects of better prices for silver, also protection for the lead industry in Canada, now under consideration by the Dominion Government, together with the addition of a zinc product, it is sincerely to be hoped that the ensuing year will see new life infused into this highly mineralized and rich section of British Columbia.

ALFRED C. GARDE.

Sandon, B. C., Feb. 8.

The Fluor Spar and Zinc Mines of Kentucky and Illinois.

NUMBER 11—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by
F. H. HARWOOD

Until recently the only worked deposits of fluorite in the United States were in southern Illinois. The supply was very uncertain, owing to water in the mines, and poor roads, it being necessary to haul the spar by team to the Ohio river for shipping to market.

The increase in the use of fluor spar as a flux by the steel mills of Pittsburgh, Pa., and the iron furnaces of Birmingham, Easley and Bessemer, Ala., and the glass factories of Indiana, resulted in opening valuable and extensive beds or veins of

protoxide and 35.2% carbonic acid. The average returns from the shipments of this mine run from 43% to 47% zinc. Trainloads are shipped from Marion to the reduction works at Mineral Point, Wis., and Joplin, Mo. The engravings on this page illustrate this mine and vicinity.

THE SOUTHERN ILLINOIS FLUORITE DISTRICT.—In Pope and Hardin counties the geological conditions are similar to those in the western Kentucky district, the several veins trending in a northeast-southwest direction. The veins so far discovered are in the southwest part of Hardin county and northeast section of Pope county. Prospecting, however, is being carried on in all parts of the above counties and discoveries made of carbonate of zinc, galena and iron ore.

Golconda is the gateway of the southern Illinois fields. Until recently this point was without railroad communication. The extension of a branch line by the Illinois Central R. R. from Reevesville to Gol-

conda, crusher, bucket elevator, four sets of jigs, and a Griffin mill for grinding. The spar taken from this mine is mixed with galena and some zinc blende. The large lumps of pure spar are separated. The rest is crushed, screened to four sizes and jigged. The capacity of this mine is 100 tons of spar per day. The shipping is all via river to Evansville, Indiana, or Golconda, Illinois, from which points it is re-shipped via the Illinois Central R. R.

The Fair View mine was worked for lead fifty years ago, but has not been in operation for fifteen or twenty years. The workings extend along a vein several hundred feet, and are in the vicinity of the Rosi Claire property. Recently the property has passed into the hands of a company, who are dismantling the old workings and erecting new buildings and placing in operation the latest improved machinery. This mine is expected to become one of the largest producers of fluor spar in the entire district.



The Zinc and Fluor Spar Mines of Kentucky.

fluorite in Kentucky. This, with the improvements made in mining in southern Illinois, removes much uncertainty as to supply.

A study of the western Kentucky and southern Illinois fields shows that most of the fluor is found in veins, which gradually widen, and at a depth of 150 to 200 feet from the surface are from 15 to 20 feet in width. A marked feature of these veins is that they continue in straight lines, most of them in a northeast-southwest direction for several miles. This is indicated by observation of the fact that many of the mines and prospects already opened are on the same line, and that their veins trend in the same direction.

The Old Jim mine is the most noted mine in the district. It is owned and operated by Blue & Nunn, and is located 4 miles northwest of Marion, Ky., and is one of the largest carbonate of zinc properties in the world. The vein in places is 68 feet in width, solid carbonate of zinc. The mine is operated or worked by the open cut system. The ore is comparatively clean, but is run through a washer before shipping. This ore when pure contains 64.8% zinc

condita will facilitate the development of the mineral resources of both Pope and Hardin counties. Golconda is located on the Ohio river, and has 1500 inhabitants, with substantial business houses and handsome residences. The following mining properties are tributary to this point:

The Rosi Claire mine is situated at Rosi Claire, Hardin county, a small town on the Ohio river 12 miles northeast of Golconda. The property is owned and operated by the Rosi Claire Fluor Spar Co. and is the best equipped mine in either the western Kentucky or southern Illinois districts. The vein was worked many years ago for lead. Shafts were sunk 100 feet in depth, but little drifting was done. The present owners have been working the property ten years. The main shaft is 300 feet deep, having four levels, the first at a depth of 100 feet, levels being placed 50 feet apart. The levels have been driven 700 feet on each side of the shaft. At the depth of 300 feet the vein of spar is 20 feet wide. The plant is equipped with two large boilers and hoisting engines, and an engine for operating the washing

The Lead Hill mine is located 4 miles north of Cave-in-Rock, Illinois. Until a year ago it was not known that any fluor spar existed in that vicinity. During the past year extensive operations have been in progress. Here a tunnel has been run, 7 feet high and of about the same width, with roof and floor in fluor spar. The output of this mine is fifty tons per day. It is owned and operated by the Hardin County Mineral & Mining Co.

The Empire mine, operated by the Empire Mining Co. of Cleveland, Ohio, promises to become an important producer, not only of fluor spar, but also of carbonate of zinc and lead. This property was worked for lead a number of years ago, the fluor spar being used to macadamize driveways and roads around the mine. The nearest railroad point to this property is Golconda, the distance by turnpike being 15 miles, to which point the mineral is being hauled for shipping.

The Grand Pierre Lead & Zinc Mining Co. own valuable mineral lands in Pope county and are operating the properties for fluor spar, lead and zinc, all

of which are found in paying quantities. The mines are in the eastern part of Pope county, in the heart of the old Government mineral reservation. Shafts are being sunk at various points, and from present indications the same fissure veins exist as in the Kentucky district. The shipping point for these mines is Golconda.

There are other good properties in Pope county, but up to the present time little development has been done owing to lack of transportation.

There are thousands of acres of land still open to the prospector. Leases or options can be obtained on favorable terms.

The Breakage of Stamp Stems.

Written for the MINING AND SCIENTIFIC PRESS by M. P. BOSS.

Notwithstanding the stamp has been the subject of so much study by so many hard-headed practical men, it seems strange that the breakage of stamp stems should have received so little attention, for the writer knows of no one, outside of himself, who seems to have given any particular attention to it, and his experience harks back to 1869. It appears generally to have been fully accepted that the stem was entitled to break from crystallization, unavoidably incident to the dropping of the stamp, for which no relief could be expected.

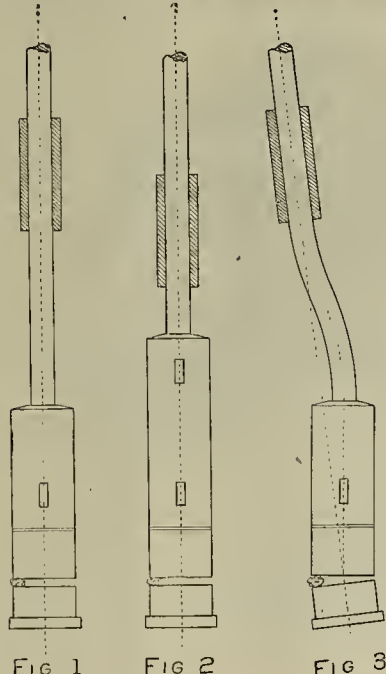
An analysis of the drop of the stamp will show that vibration of the stem can in a measure be regulated, and vibration is the cause of crystallization.

We will start out by saying that an absolutely straight fall on a perpendicular line and landing on an even and level bottom will generate minimum vibration and the dropping of a stamp in such a way that gives the greatest lateral deflection of the stem will cause maximum vibration. This is given as an axiom.

Rigid and fairly close fitting guides are a factor in avoiding stem deflection. Another factor is a long stamp head as against a short one, as the long stamp head yields a more acute angle generating the deflection than does the short stamp head, hence it is less effective in deflecting.

But a greater factor than these is the distance of the lower guide from the stamp head. With a given lateral pressure at the stamp head the deflection of the stem will augment as it increases in length between the head and the guide.

Referring to the cuts, Fig. 1 is a scale drawing of



an average stamp with new shoe and new die, as commonly found in the market. Fig. 2 is a drawing to the same scale, of a standard stamp of the writer's pattern. Fig. 3 is a drawing showing in an exaggerated way the manner of natural deflection when the stamp falls upon a hard rock at one edge of the shoe.

It requires no elaborate explanation to make clear that the lateral deflection of the stem must be far greater with the stamp shown in Fig. 1 than with the stamp in Fig. 2, when striking at the edge of the shoe as shown, hence less crystallization. This train of reasoning was evolved by the writer so long ago, and practically applied by him, that it has long passed from the realm of theory and speculation to that of established practice, which has eminently succeeded in its object.

Guides of wood wear too fast to admit of keeping a close fit to the stem. They also accumulate grit and wear away the stem immeasurably faster than a soft cast-iron guide. The latter under proper treatment becomes smooth and polished upon its inner surface and retains no grit.

The stamp head in Fig. 1 when fully down is only 8

inches below the guide. This necessitates that the housing be made around the stamp head instead of around the stem, as is customary with the stamp shown in Fig. 1. This is not so simple a proposition but it is very effectively done.

Recapitulating, a properly proportioned stamp of good material should run for many years without breakage of a stem, when constructed and operated under following conditions:

Guides to be rigid in place and to be close fitting at all times; stamp head to be long; stamp head as close to lower guide as it is possible to run it; stamp never to fall iron to iron; stamp never to run too fast to complete its drop before being picked up again, and proper cam alignment. If a stem breaks in midway of its length it is due to too fast running or to improper cam alignment, assuming that the guides fit properly.

Hydraulic Mining in California.

Written for the MINING AND SCIENTIFIC PRESS by W. E. THORNE.

This is a short description of placer mining with the hydraulic elevator, in ground having a small grade, so that we were compelled to have an artificial grade.

In order to do this we installed an Evans No. 2 hydraulic elevator, and worked this with a head of 250 feet with 250 miner's inches and maximum lift of 25 feet. We found when working to maximum capacity that the elevator would handle about .75 of a cubic yard per minute. We worked four men on the day shift eleven hours and three on the night shift eleven hours, an average of twenty-two hours per day. We handled about 230 cubic yards per day, at a cost of 30 cents per cubic yard. This excessive cost was caused by the shallow gravel—7 feet average depth, also by the great number of logs, boulders, stumps, etc., all of which were handled by stone hoat, employing one man and horse during day shift, with the help of two other men about half the time. Labor, 25 cents per hour; water, 5 cents per inch per hour. Without logs or boulders, and with a full head of water, we could easily have doubled our capacity.

We used 300 feet of 22-inch pipe at the upper end of the line, reducing to 1000 feet of 15 inch, then a "Y" with two 11-inch legs. On one leg we used an 11-inch "Y" with two 11-inch legs. One 11 inch line ran direct to the east, while on the others we had 11-inch gates, each with two giants, only running one giant at a time, using the gates to direct the water from one giant to the other.

Our sumps for the east were 4 5 feet deep, 5 5 feet wide by 9 feet long and gave us plenty of room. We used a grizzly with openings 6 feet by 6 inches in the clear. Our angle of upcast was 80° from the horizontal. This gave the best results.

The sluices were made 12 feet long, with four collars to each box. Bottoms of two 2x12-inch planks, making the sluices 24 inches inside. The sides were formed of one 1½x18 inches and on this one 1x12 inches, making them 28 inches deep in the clear. The sluices were cut off square at each end, then fitted together, and held by a 6-inch strip of duck over the outside of the joint. This was secured by a collar of 2x6 inches formed in the following manner: Two pieces of 2x6 inches, each 43 inches long, were cut,

to place with the bolts. Then an upright piece of 2x6 inch, 29 inches long, was placed at the side of the joint, the head and foot being secured by the block at top and bottom, as shown in the accompanying sketch, and tightened with a wedge. By this method we had but a small amount of leakage.

In taking down the sluices, in order to move to a new set, the ends of our sluices were not split, and having both ends the same width, gave us an even flow of water with a minimum amount of clogging.

Our head sluice was made the same size as the others, only boxed in 5.5 feet high, held by collars of 2x6 inches, lined inside of top with iron, where the discharge from upcast struck the top to prevent wearing a hole in it.

Our sluices were set on top of a framework of round poles 4 5 inches at small end, set 4 feet from center to center of each, and 5 feet on the side, with 2x6-inch by 5-foot spiked across for sluices to rest on, using six supports for first two sluices and four for the balance. All posts held in place by 2x6-inch by 12-foot and 14-foot struts, spiked fast to each post. Each post was set on bedrock. We used five 12-foot sluices, making a 60 foot string, with an undercurrent under the last sluice. The opening cut in the sluice was 22x13 inches, with opening between grizzly bars of ¼ inch. Undercurrent, 4x12 feet, with 9-inch drop. Hungarian rifles were placed in the main sluices 3 inches deep, and in undercurrent 1½ inch deep.

Many pan tests of the tailings showed but very small amount of fine gold—approximately 3 cents per cubic yard.

Our tailings gave but little trouble by piling up at the lower end of sluices.

We found that for a good depth of gravel—say 20 feet of fine material, with small grade—the elevator is well adapted, but like many other processes, if all is not favorable we cannot reach the maximum capacity and maintain it.

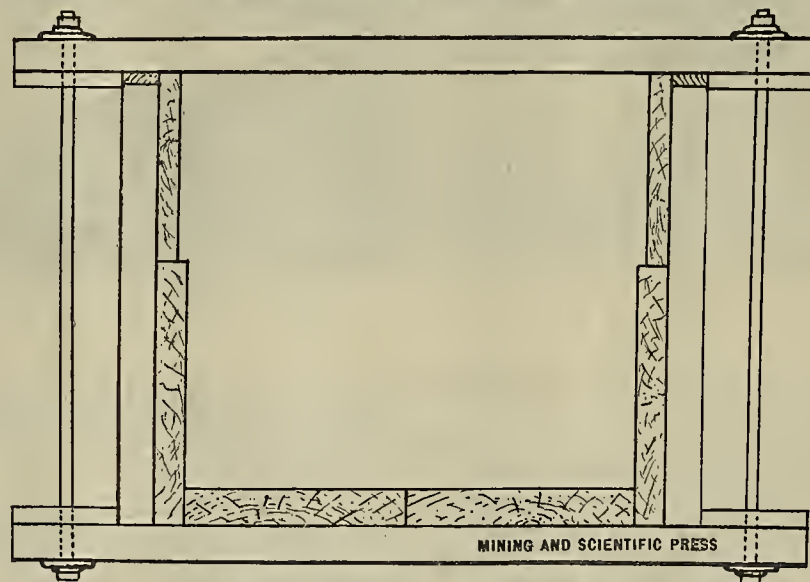
Denver, Colo., Feb. 6.

How to Treat a Belt.

The man who will put resin on his belt is either a fool or a knave. The belt is less generally understood than probably any other staple mechanical appliance. No person ever bought a cheap belt that was a good belt. The utility of belts may generally be gauged by the price paid for them, and when you induce some one to sell you a belt at a lower figure than the price first quoted, you—not the dealer—are the loser.

Often belts are made uneven and with the best of care soon get out of shape. We sometimes find a belt that ordinarily runs easy on the pulleys suddenly inclined to run to either one side or the other of the driven pulley. Either the belt has been too slack or the load has been increased from want of lubrication or other cause. In either case it will run off if you insist on applying the power. The remedy would be to either take up the belt, thoroughly oil the journals or take off the extra load—maybe a combination of all.

Then the belt may run to one side of the driven pulley when the driven shaft gets out of line with the



Sketch Showing Construction of Collar on Sluice Box Joints.

each having a block 1x6x6 inches nailed flat and flush with the ends, increasing the thickness from 2 inches to 3 inches. Three inches from the end of each strip a ¾-inch hole was bored to receive a ¾-inch iron rod 38 inches long, having solid head, with thread, nut and washer at opposite end. The strips were placed opposite the joints in the flume, one piece above and one underneath. These were drawn

driving shaft. In this case the belt runs to the low side of the pulley.

If two shafts are parallel and there is a high place on the pulley, then a belt will run to the high place; but if the shafts are out of line and the face of the pulley straight, then the belt will run to the low side or that closest to the driving shaft. The remedy would be to line up your shafting.—Power.

Silver Mining and Smelting in Mongolia.*

By YANG TSANG AOO, Tong Shan, China.

I will endeavor to describe the methods of silver mining and smelting employed by the natives in Mongolia. Modern methods have been applied there, but with little success, and, since they are familiar to most members of the Institute, I will simply mention that the failure was due to the high price of coke used in smelting the ore in modern furnaces, and to the unsuitable mill machinery employed for concentrating the galena, which is finely distributed in the ore.

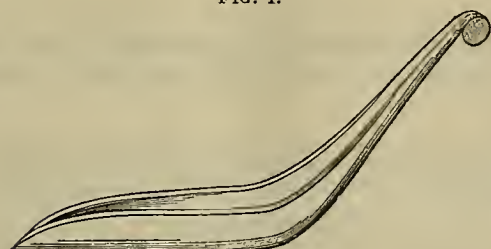
The Jehol silver mines are about 45 miles northeast of Jehol, the capital of Mongolia. They embrace two mines, 5 miles apart, the Ku Shan Tze mine and the Yen Tung Shan mine. They were first worked by natives fifty years ago, about the time when mining was so flourishing in other parts of the world—for instance, in California and Australia. The upper part of the vein is galena mixed with ironstone, and is 2 to 4 feet thick. At lower levels the vein is composed of silver-lead ore running between quartz porphyry walls. Limestone, talc and black shale, colored by graphite, are found in other parts of the mine. Crystalline limestone is found 1 mile northeast of Ku Shan Tze. Granite is encountered in the Yen Tung Shan mine.

MINING—The native method of working the mines is most primitive. The same method may have been employed a thousand years ago. A small inclined shaft 4x4 feet is sunk in the vein stuff where the appearances are most favorable. Another shaft is sunk 20 or 30 yards away, for ventilation. The shaft follows the vein in zigzag fashion in whichever direction the vein appears to be richest. Timber is used only in soft ground. Where the ground is hard the roof is cut into an arch form. In some places, instead of using ladders, steps are cut in the rock, just wide enough to hold one foot. The deepest native workings are 400 feet below the surface. As the workings are above water level very little water is met with. The water in the bottom of the workings is carried up to the surface in willow buckets by boys. When the water is abundant and requires several men each shift to drain the mine, sumps 3x2 feet are made every 4 or 5 feet along the inclined shaft. Men are placed at every sump to bail up the water to the next higher sump, and so on to the surface. Although labor is cheap in China, this method of draining a mine is very expensive. When fifty or more men are employed in bailing water from one mine, it would be much more economical to use steam pumps. Formerly black powder was used for blasting. Dynamite was introduced by European engineers in 1889. Since then the miners will not employ any ordinary explosives, but only dynamite, in hard rocks. Where the ore is rich the drill and hammer are generally used for picking out the ore. Blasting is resorted to where the ore is poor. Boys carry the ore up to the shaft mouth in round, shallow willow baskets.

The miners do not receive any regular wages. The owners of the mine supply them with board and lodging, and they receive a part of the proceeds of the smelting. If the ore is worth 150 to 200 ounces a ton, each miner may get \$20 to \$30 a month. In case the ore is poor, containing less than 80 ounces a ton, it would only pay for the fuel used in smelting, and for the men's board and the explosives. At one time, when a company was formed to work the mines, the company collected 30% to 40% of the proceeds of the smelting, according to the richness of the various workings, and the contractors received the balance as payment for the expenses of mining the ore and smelting it, including the explosives, tools, fuel and the miner's wages. The company had only to look after the general drainage of the mine and the timbering of the main levels. The highest output of silver was in 1894, amounting to 140,000 ounces. The yearly average is between 80,000 and 100,000 ounces.

SMELTING—The ore as it comes out of the mine is first dressed by breaking it into small pieces, about 1½ inch square, and picking out the waste rock. The waste ore is then concentrated by washing in a spoon-like pan (Fig. 1). The water used for washing

FIG. 1.



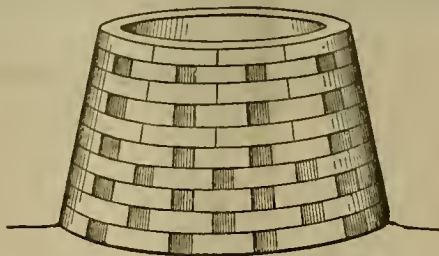
Concentrating-Pan.

is mine water pumped from the shaft. It is allowed to run into ditches 4 feet wide and 3 feet deep,

*Trans. Am. Inst. Min. Eng.

divided into two compartments 5 feet long, and lined with timber so that the sides will not cave in. The pan floats in the water, is held by both hands and a wavy motion is given to it. The heaviest particles settle at the back or bottom of the pan. The dressed and concentrated ore is then roasted in a primitive roasting furnace. It is simply a round wall of blue bricks, perforated at intervals to allow the escape of gases, as shown in Fig. 2. A space 3 feet wide is

FIG. 2.

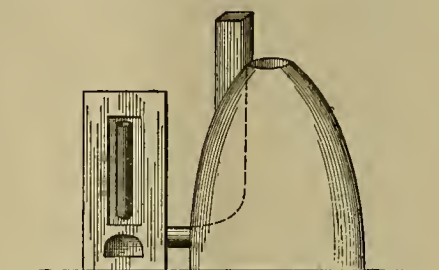


Mongolian Roasting Furnace.

left open for a door. When the furnace is charged full the door is built up. The bottom of the furnace is composed of wood ashes 1 foot deep. The furnace is 5 feet high and 6 feet in diameter. A layer of charcoal is first laid in the bottom of the furnace, then a layer of ore, then a layer of charcoal and another of ore, and so on till the furnace is full. It requires a week's roasting before the ore is sweet.

When cold, the roasted ore is transferred to a small smelting furnace, as shown in Fig. 3. It is built of

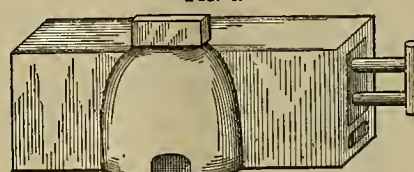
FIG. 3.



Smelting-Furnace used in Mongolia.

sun-dried bricks, is 3 feet high and 1 foot in internal diameter, cone-shaped, and open at the top, so that the ore and flux can be fed in. Inside of the furnace there is a protrusion, so that the blast may be directed toward the ore. The bellows consists of a square box of wood, 4x3x1½ foot, with a valve at each end, as seen in Fig. 4. It is worked by two men

FIG. 4.

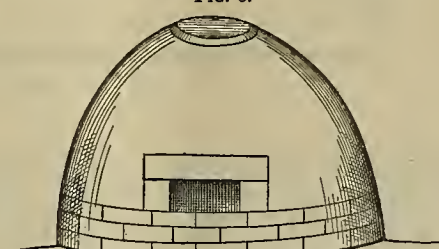


Bellows.

pulling a rope on each side of the bellows. The furnace is dried by heating with charcoal the night before using. The bottom is lined with wood ashes. A layer of charcoal is first put in and then a layer of ore mixed with a proper proportion of flux, which is composed of old cupel bottoms containing about 80% of lead oxide. The blast is put on. Ore and flux are added from time to time, till there are about 100 pounds of silver-lead in the bottom. The slag is taken out through a hole near the bottom of the furnace. When there is sufficient lead in the bottom water is poured into the furnace to quench the fire and cool the silver-lead. A big hole is made at the bottom of the furnace, and the lead is extracted in the form of a round cake.

It is cleaned and transferred to a crude cupel furnace, as shown in Figs. 5 and 6. The cupel furnace

FIG. 5.

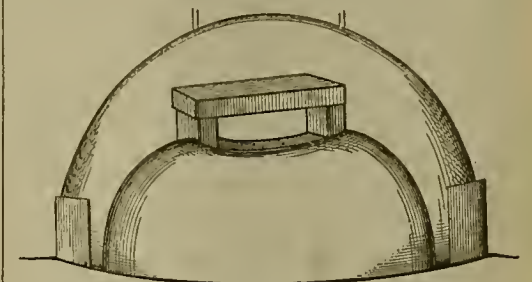


Mongolian Cupel-Furnace, Front Elevation.

is about 4 feet long, 3 feet wide and 2½ feet high, and built of rough mud bricks. These furnaces are located in groups of a dozen or more, as occasion

may require. In appearance they resemble the adobe ovens used in Mexico. The cupel proper, or muffle, is 18x12x8 inches. The cupel bottom (Fig. 6) is com-

FIG. 6.



Cupel-Furnace, Showing Cupel in Interior.

posed of fine sifted wood ashes collected from kitchen fires. A pile of ashes is dumped on the ground and made into an oblong shape. It is hardened by pressing on it with one foot. The silver-lead is wrapped in coarse paper and placed on top of the ashes. Then a muffle is made over it by forming an arch with mud bricks. Charcoal is piled on top of the muffle and ignited. Mud mixed with straw is smeared over the charcoal, leaving a hole in the top for ventilation. The complete cupellation of the 100 pounds of lead takes about ten hours. When the silver brightens water is poured on and the silver is extracted with tongs, washed, and cleaned with brushes. It is then cut up and is ready to be made into sycee-shoes, which weigh from 5 to 50 ounces each. The fineness of the silver is 995.

It is a curious fact that almost every one in the neighborhood of the silver mines has some crude method of extracting silver from galena. All the stolen ores are smelted by the wives and children of miners. The smoke from their blast furnaces often gives a clue to the men sent out to arrest the people who smelt ores in secret.

Rule for Computing Maximum Revolutions for Flywheels.

By W. H. BOEHM, member American Society Mechanical Engineers.

Methods that shorten the labor of computation are welcomed alike by the busy engineer and the bustling office man. Short-cut rules are sought not only to save time, but also to minimize the chances of error. We give a handy rule for computing the maximum allowable number of revolutions for cast iron wheels of any given diameter.

The rule is based upon the current practice of allowing a rim speed of one mile per minute for well made cast iron wheels, and so does not take into consideration the difference in strength between solid and sectional wheels.

The rule gives very accurately the number of revolutions per minute at which the mile-a-minute danger point is reached. So far as we know the method is new and is as follows:

RULE.—To compute the maximum allowable number of revolutions per minute for cast iron wheels when given the diameter of the wheel in feet. Divide the number 1680 by the diameter. This is expressed by the following formula:

$$\text{Maximum revolutions per minute} = \frac{1680}{D}$$

EXAMPLE.—What is the maximum allowable number of revolutions per minute for a well made cast iron wheel 16 feet in diameter? Here we have

$$\text{Maximum revolutions per minute} = \frac{1680}{16} = 105.$$

That is, a 16-foot cast iron wheel should never be run faster than 105 revolutions per minute.

A Correction.

In the issue of January 24th, on page 56, appeared an illustrated article on the electro-magnetic separation of zinc blende from the sulphides of iron and zinc in ores. Near the conclusion of the article in a table of assays the lead content of the zinc concentrated product was stated to be 10.60%. This should have read 0.60%. The presence of lead in considerable quantity in the zinc product would be detrimental and it would be practically lost if sent to the smelter.

THERE are those who believe that gold nuggets are formed in the gravel of streams from gold-bearing solutions passing through the gravel. Those who advocate this idea are theorists, with little or no practical experience. No miner who has actually worked placer mines for even a few months believes this, as the evidences found daily in the mine lead to a different conclusion. Moreover, if gold-bearing solutions exist in the beds of streams there is no evidence that it has ever been detected by those competent to make such determination.

DURING 1902 the mines at Almaden, Spain, produced 1375 tons of quicksilver.

DISCOVERY of mineral in place, whether payable or not, must precede location of a claim. This discovery must be made at some place within the limits of the claim as subsequently located. It need not be in or near the center of the location, but the claim must be staked in such manner that the vein shall run as nearly as possible through its center.

"Formation of Nuggets."

TO THE EDITOR:—You recently published an article on the "Formation of Nuggets," the line of argument of the article being, in fact, that the nuggets grew—increased their size "by agglomeration"—stating that "if it is admitted that the gold was originally in solution, and, after finding its way into the gravel, was reduced to the metallic state," etc.

No placer miner who actually mined and took out

or quartz still adhering to the gold, being of an almost entirely different material from the surrounding gravel and sand in which the nuggets are found, clearly showing the character of the ore of the vein or lode filling from the eroded outcropping which contained the nuggets in a metallic state, from which by glacial or other erosion the nuggets were separated and afterwards, with other eroded material, formed the deposits generally known as placers. Because once in a very great while a so-called "composition nugget" is found which in an acid bath leaves behind iron, sand and smaller nuggets or

coarse gold (lode nuggets) lodes, at the sides and heads of many of the rich gold placers. In 1894 a six-ounce placer gold nugget was taken out of the Peabody placer in Gold Run. Above this placer are the Junho, Extension and Jessie gold lode mines. On July 23, 1887, the Tom's Baby (weighing 156 ozs. 11 dwts. 7 grs.) gold nugget was taken out of the Gold Flake lode mine on Farncomb hill, which is a few hundred feet up the hillside from the rich American gulch placers, which had produced many fine gold nuggets, some of which were of heavy leaf or wire gold that had been by glacial action rolled and pounded into comparatively solid nuggets. In cleaning such "rolled" nuggets their structure was disclosed—their origin—and a search uphill from the placers led to the discovery of the wonderful veins of the rich gold ores of Farncomb hill. Specimens of Farncomb hill's crystallized, wire, leaf, moss and "chunk" gold were exhibited at the World's Fair at Chicago, and the collection under the name of the "Collingwood Collection" was awarded a medal.

Gold is heavy and settles, at the first opportunity, to the bottom of a stream, unless a stratum of stiff clay prevents its reaching the bedrock. The nuggets and coarse gold are found nearest the lode whence the gold came, when the topography has been of a nature to afford them a resting place. Farther down stream the lighter flakes and small grains have been deposited as the stream widened and the force of the current abated. Fine flake and "flour" gold is often carried many miles down stream by the force of the water, which keeps them turning over and over and sliding along with the muddy water of floods or freshets. Metallic gold, wires and thick gold leaves have also been found in chunks of lead ore; also wires in copper and leaves in iron ore in the lode mines of Farncomb hill, showing plainly that the lead, copper or iron was found or deposited after the metallic gold had been made in the veins. Such specimens are much more worthy of the real scientists' speculation and research than the few hattered and partly "rusty" gold placer nuggets that may fall under their observation. The gold in the placers came from lodes.

Breckenridge, Colo., Jan. 28. R. J. A. WIDMAR.

The Flow of Water in Open Channels.

The measurement of water in open channels is a subject which has been given much attention by Western hydraulic engineers. This has been the outcome of necessity in the construction and operation of hydraulic mining plants, and several mining States have provided extensive facilities for observing the variations of flow of water in ditches and flumes. Numerous formulas have been devised which are calculated to make the measurement of flowing water easily practicable, but the great variation in the shape, size and grade of ditches and flumes has rendered most of these formulas relatively useless under the greatly varying conditions on the same canal or flume. Ditch lines built originally with greater or less uniformity as regards cross sections become greatly varied. The flow is reduced by percolation of water into porous sections, by evaporation, and by leakage. Slides of earth and rock occur, to some extent damming up the ditch and retarding the flow. Soft sides are cut away, changing the area of cross section and the velocity.

In his treatise on hydraulic mining A. J. Bowie gives the following formula for measurement of water in ditches:

$$Q = ac\sqrt{rs}$$

Q is the quantity of water which the ditch is capable of carrying in cubic feet per second.

a the effective area of cross section of ditch, as originally constructed, in square feet.

r the hydraulic mean depth in feet.

s the fall of surface in a unit of length.

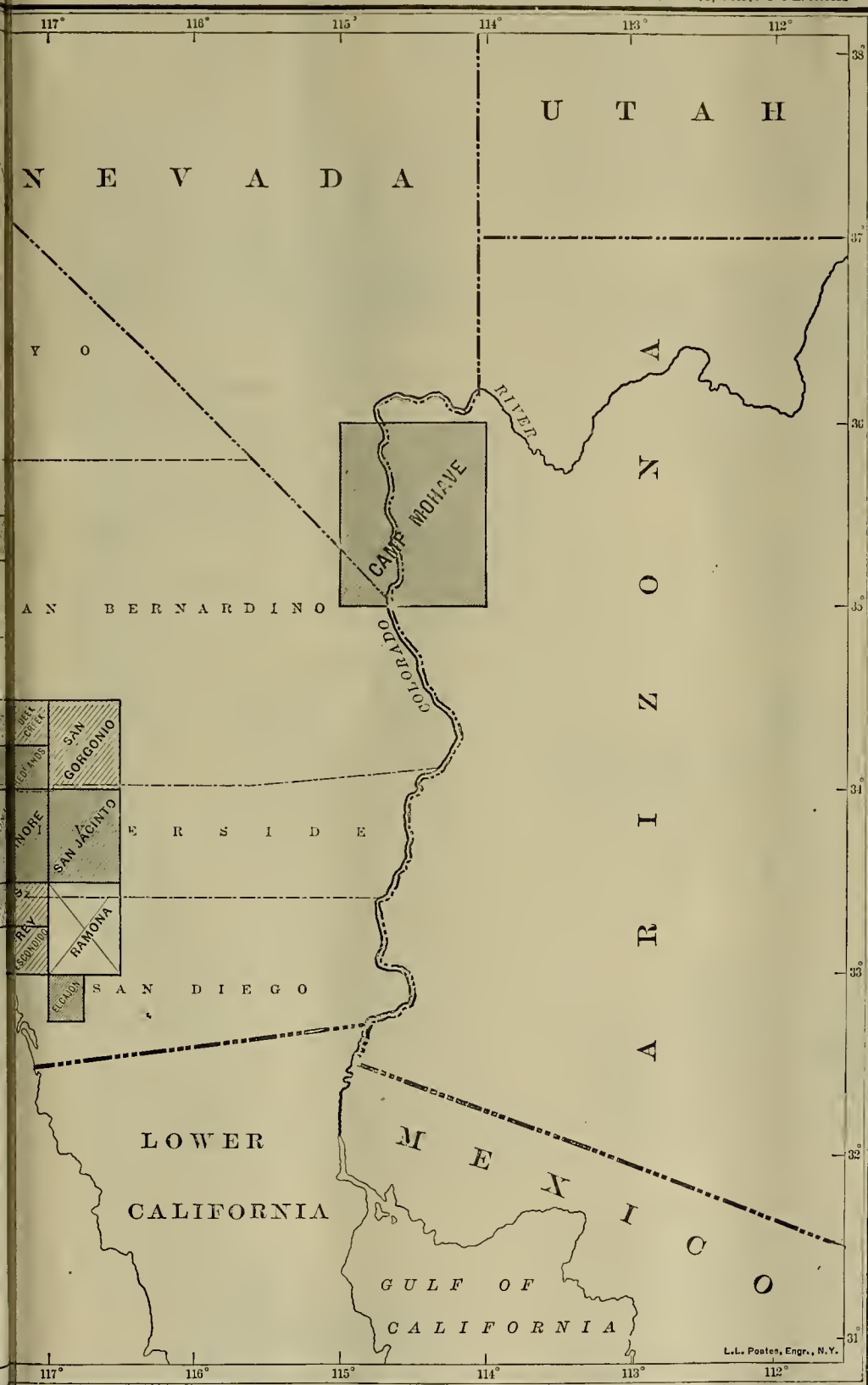
c a coefficient covering all common losses.

Owing to the number of causes influencing the flow of water the coefficient is greatly variable. It has been possible, however, by means of a table of statistics, carefully compiled from the official records of several companies owning ditches, kept during a series of years, to gain valuable knowledge of the result of these disturbing factors in the variation between the quantity of water admitted at the head of a ditch and the amount delivered at its lower end, and to establish thereby a coefficient of loss from all causes, which was found to vary from 31 to 45. In some cases, as in well constructed new ditches and flumes, where some of the losses above indicated are comparatively low the coefficient is much higher, but in ditches constructed on rough mountain sides, in rocks more or less disintegrated, the coefficients are about as here stated for ditches on heavy grades of 40 miles length and flowing from 60 to 80 cubic feet per second. For ditches of this class Mr. Bowie gives the following formula:

$$Q = 31 \text{ to } 45 a\sqrt{rs}$$

In this the same value is given each factor as in the formula previously stated, with the exception of c, which is here determined to be from 31 to 45.

TWENTY-SECOND ANNUAL REPORT, PART I PL. XXIII



PROGRESS OF TOPOGRAPHIC SURVEYING.

placer nuggets of either gold or silver will admit that the nuggets were formed in placers from solutions. There are native silver nuggets found here in certain portions of the Blue mountains, in Summit county, Colorado, about 2 miles south of Breckenridge. A silver nugget weighing almost an ounce and many smaller ones have been washed out of the river gravel in placering for gold. In every placer mine here where nuggets are found (and the nuggets of gold found in the placer mines of the Blue river gold fields range in value from a few cents up to \$495) there are also found nuggets containing slate

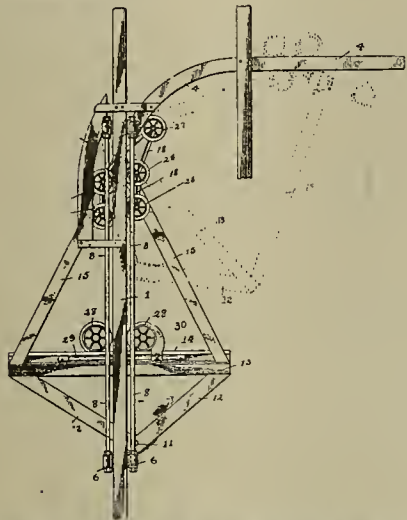
grains of gold, some hook-learned expert sets up a theory that nuggets were formed from a solution or agglomeration in the placer where found. In a residence of nearly eighteen years in Summit county, Colorado, which is the hanner gold nugget producer of this State, I have never seen any of the iron-gold-sand "agglomerated placer nuggets," and have heard of but one—which was supposed to have been a chunk of rusty, hard amalgam. The theory that the gold and silver nuggets found in placers have come from nearby lodes is amply carried out in the Breckenridge gold belt by the discovery of gold, and

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 3, 1903.

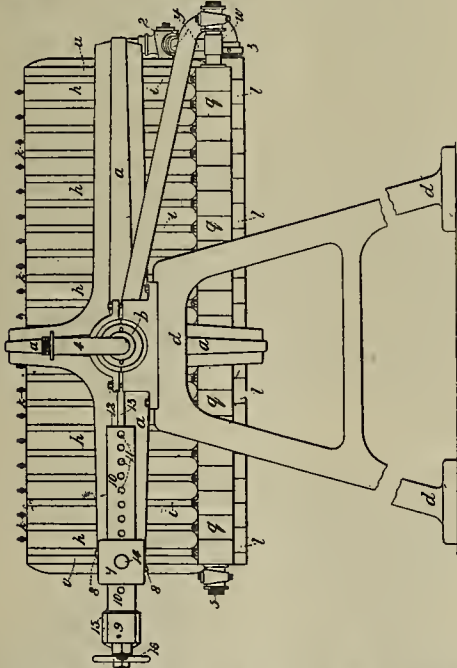
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SELF-DUMPING MINE CAGE.—No. 719,258; F. A. Ray, Columbus, Ohio.



In self-dumping mine cage, combination of fixed guide standards 1, lifting frame arranged therein and adapted to be elevated vertically, guide standards having inclined recesses 2 and inclined rails 4 leading from lower portions of recesses, of cage comprising platform 13 and standards 15 and 12 mounted to swing in lifting frame, shaft 16 on which upper portion of cage is journaled, elongated truck or wheel frames mounted on ends of shaft and wheels journaled in opposing arms of frame, wheels adapted to embrace opposite sides of standards 1 and pilot guide wheel journaled in upper end of each frame.

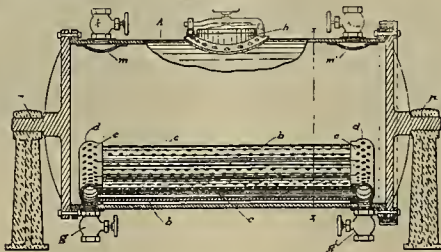
FILTER AND EXTRACTOR PRESS.—No. 719,438; J. G. Crossman, Watford, England.



Improved filter and extractor press comprising frame supporting sectional filter, hollow trunnions upon which frame is pivotally mounted, hollow press frames forming compartments of filter and holding material to be treated, corrugated intermediate partition plates disposed between press frames and carrying filtering fabric on either side of corrugated plates, annular bosses on press frames externally of filtering area of plates, bosses forming when several press frames and intermediate plates are closed together, continuous inlet pipe for conveying material to be treated to compartments of filter, two similar bosses on intermediate plates forming when parts are assembled, continuous inlet and outlet pipes for liquor to be treated, passages in one set of bosses leading from one pipe to one side of intermediate plate and passages leading from other pipe to other side of intermediate filter plate, connection from liquor inlet and outlet pipes to one hollow trunnion and connections from pipe formed by bosses of compartment frames leading to other hollow trunnion, means for allowing plates and frame of filter to be

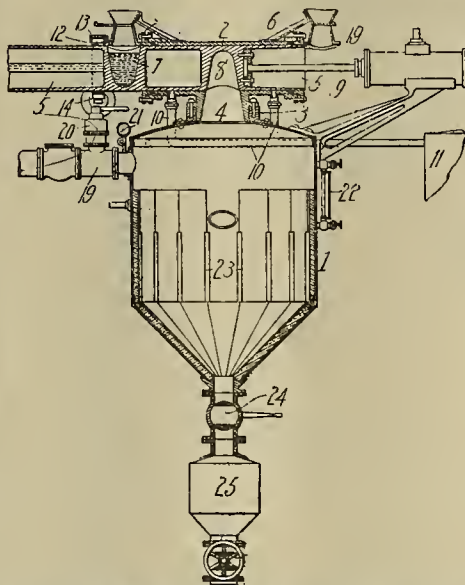
separated or assembled, and means for securing them in position when assembled.

CHLORINATION BARREL.—No. 719,664; J. B. Hefernan, Colorado Springs, Colo.



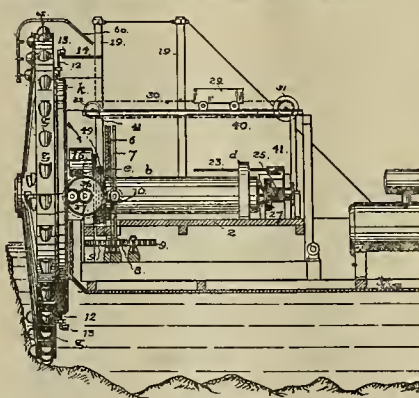
In chlorination barrel series of pipes having numerous perforations throughout their lengths, arranged in parallel and lying close to inside wall of barrel, and having suitable connections with outside fluid pressure system.

APPARATUS FOR GENERATING STEAM FROM HOT SLAG.—No. 719,520; H. A. Seymour, Washington, D. C.



Combination with steam generator, of reciprocating and rotary plunger provided with slag receptacle and adapted to feed charges of hot slag into generator and to discharge them into body of water contained therein.

DREDGING AND EXCAVATING MACHINE.—No. 719,567; J. J. Conlin, San Francisco, Cal.



In dredging and excavating machine, combination with movable platform, dredging wheel mounted thereon for rotation in upright plane, means for raising and lowering platform, comprising fixed nuts in platform on opposite sides of axle, screw rods working through nuts, fixed bearings below movable platform in which lower ends of screw rods are fitted to rotate, power-driven shafts mounted on platform and gears connecting screw rods with shafts to rotate rods in unison, and adjustable counterbalance on movable platform.

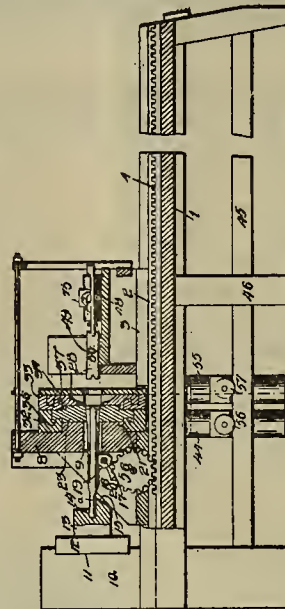
GOLD SEPARATING APPARATUS FOR DREDGING MACHINES.—No. 719,582; J. H. Gray, San Francisco, Cal.



The combination with revoluble cylindrical screen

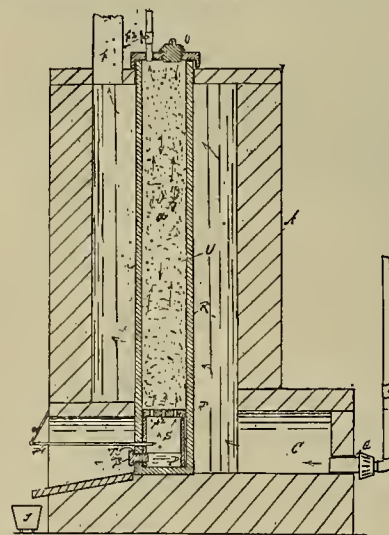
of plurality of aprons beneath screen having inclination laterally outward in opposite directions from ridge situated longitudinally under center of screen, an equalizing bar on lower end of each of aprons, adjustable gate between ridge and bottom of screen, means for setting and holding gate at varying angles in either direction from central position.

DRILL SHAPER AND SHARPENER.—No. 719,874; J. Retallack, Victor, Colo.



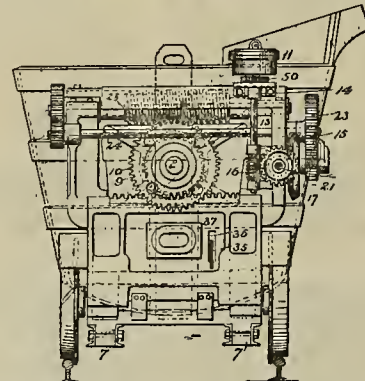
In a machine of the class described, set of radially movable clamping dies having V-shaped ridges in combination with independently movable trimming tools guided upon clamping dies and having V-shaped recesses engaging ridges, also engaging edges of tool that is being operated upon.

PROCESS OF PRODUCING ALUMINUM.—No. 719,698; H. F. D. Schwan, St. Louis, Mo.



Process of reducing aluminum compound, which consists in subjecting compound to action of reducing agent, of which sulphur is component, at temperature sufficient to effect reduction.

CINDER OR HOT METAL CAR FOR BLAST FURNACES.—No. 719,706; E. A. Weimer, Lebanon, Pa.



A cinder or other car having ladle provided with trunnion at each end, elongated seats or bearings on which trunnions are supported, toothed wheel on one of trunnions and revoluble member engaging toothed wheel; in combination with motor connected to member to impart lateral and revoluble motion to ladle.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The steamship Valencia sailed from Tacoma, Wash., Feb. 8th, with 100 men, 75 horses and 400 tons of provisions, destined for the Mazina placers and the copper district 185 miles inland from Valdez. They are being sent by the Chitina Development Co., controlled by R. Biel, J. D. Menach and H. Meyer, who own 200 claims in the Mazina district.

ARIZONA.

COCHISE COUNTY.

The Arizona C. M. & S. Co. is preparing to work a group of claims near the Black Diamond Co.'s claims, 18 miles from Tombstone.

The Calumet & Pittsburg, near Bisbee, have their pumps in operation.

The plant of the Dragoon Copper M. & S. Co., near Tombstone, is in operation. The shaft will be sunk to the 750-foot level.

The Black Diamond Co., near Tombstone, has blown in its smelter. The Copper Crown Co. is making arrangements to further develop its claims and will put in machinery and use drills on the 275-foot level.

COCONINO COUNTY.

J. B. Giraud of the United Gold & Platinum Co. says the company will build a smelter below Beaver Falls, 9 miles below Supai. The water at Beaver Falls will be utilized for power by means of a turbine motor. An electric railroad will be built from some point on the Santa Fe or Grand Canyon Railroad to the plant.

GILA COUNTY.

The Old Dominion smelter at Globe closed down this week, having exhausted the available supply of ore. No ore has been hoisted for two months on account of water, but will resume by the 15th inst. Grading has begun for the four-compartment shaft at a point 600 feet north of the present shaft.

C. E. Force, secretary of the Gila-Pinal M. Co., formerly the Bohtail mines, says development machinery will be put in at their Mineral creek mines, near Globe. The shaft will be sunk 300 feet. A road is being built to the new shaft and grading being done for the engine and boiler house.

A. C. Slehoth, superintendent of the Arizona & Hancock M. Co., on Mineral creek, near Globe, says sinking will be resumed. The shaft, down 250 feet, will be sunk to 450 feet, and the ground below 250 feet opened up by levels.

The Hancock & Arizona C. M. Co. will take up the option which they hold on a group of eighteen claims in the Pinto Mountain district, 16 miles southwest of Globe. The shaft is down 250 feet and in sulphide ore, which assays 10% copper.

GRAHAM COUNTY.

The Detroit C. M. Co. at Morenci propose to increase the capacity of their concentrating plant from 500 to 800 tons. To determine the machine to adopt for treating the ore after it comes from the jigs, several styles of concentrators are being tried out. After the ore is sized, passing through jigs, it is ground into pulp and carried into a tub divided into four equal compartments. The tub is fed by a set of revolving pipes, through which the ore for test is sprayed, giving each compartment of the tub an equal quantity of the same quality of ore. From each compartment in the tub each machine receives its feed.

A strike is reported on the Sapphire mine, adjoining the Emerald at Morenci. A tunnel was driven to cut the Coronado dike, and at a point in 150 feet an 8-foot lead of sulphide ore was struck which assays 7% copper.

MARICOPA COUNTY.

E. Crimmon of Lehl is developing a group of claims 12 miles northeast of Mesa City, on the south side of Salt river. The shaft is down 50 feet and this spring power will be obtained from the Highland canal.

Secretary Nickerson of the Electra M. & M. Co., near Phoenix, reports to the company one shaft down 60 feet and the other 250 feet, with a drift 35 feet west and a drift 30 feet east on the 150-foot level, and a drift 90 feet on the 210-foot level west. The ore runs 2 to 5 feet wide, and an average of thirty-one assays taken across the ore gives \$17 per ton.

The Wickenburg M. & S. D. Co. has been incorporated at Wickenburg. G. Bellairs, F. Garcia, C. B. Burson are the officers. They have bought the La Union mine, near the Grijalva, and will start development work this month. A

30-foot shaft on the ledge shows a 2-foot vein at the bottom, carrying gold values. An option has been taken on the Golden Banner group, north of the Vulture.

Superintendent Franklin of the Uncle Sam M. Co., in Blue Tank district, near Wickenburg, says the shaft will be timbered and a gasoline hoist installed and sinking continued to the 500 level.

MOHAVE COUNTY.

J. C. Nohle will work the Climax mine, Union basin, owned by J. Dundon, of Corhat. The shaft is down 100 feet.

E. T. Loy is putting up a hoisting plant on the Mother Lode mine, at Chloride, and sinking the shaft will be resumed.

The Gold Standard M. Co., recently organized to work claims at the south end of the Chemechevis mountains, has suspended operations. It is said the shaft work done so far has averaged \$27 per foot in cost.

In the Wallapai mountains the Enterprise M. Co. is developing a group of prospects and the main shaft is down 110 feet. A parallel ledge has been cut by tunnel at a higher elevation. There are six claims in the group and the company has bonded the Iowa, Texas and Big Six mines, says Superintendent L. White.

PIMA COUNTY.

The American Smelting & Oil Co. is organized at Tucson to absorb the Sunshine Paraffine Oil Co. and the smelting company. L. V. Navarro is president.

PINAL COUNTY.

The Golden Pinalades group of mines, west of Casa Grande, has been sold to Boston men.

Superintendent Brownell of the Producer M. Co., near Casa Grande, will put in a hoist and an air compressor and machine drills. Brownell has bought the Jack Rabbit mine, and will begin development this month.

YAVAPAI COUNTY.

(Special Correspondence) — The Cash mine, near the summit of Los Prietas range, 12 miles southeast of Prescott, is developed to a depth of 700 feet, having two shafts 500 and 700 feet respectively, and a third shaft sinking. The ore is a heavy sulphide with relatively small amount of silica. Zinc blende is abundant, and values chiefly in gold. The ore is crushed in mortars with low discharge. The pulp passes over 12 feet length of silver-plated copper plates, in three 4-foot sections with 1-inch drops. Concentrating tables separate the zinc and silica from iron, lead and copper sulphides, there being five tables to ten stamps of 900 pounds each. The mill crushes forty tons daily through 40-mesh screen. A large percentage of the gold is obtained by amalgamation and two separate shipping concentrated products obtained. H. Blauvelt is superintendent.

Prescott, Feb. 7.

(Special Correspondence) — The Poland mill at Poland is running twenty stamps, banding eighty tons of ore per day.

The Express group of Poland has a drift 500 feet, which gives them 450 feet depth on the vein 8 to 18 inches wide, running \$25 to \$75 per ton. They have shipped twenty-five carloads in the past three months to the smelter at Valverde and are now raising to the surface. The raises will be used as a shaft when finished; working thirty men; M. Hoveck, superintendent.

The Poland Extension M. Co. employs thirty men. The Rookery tunnel is in 610 feet, with a drift on the ledge 375 feet. On the Fitzhugh Lee the shaft is down 110 feet, with 540 feet of drift on the vein, which averages 18 inches and runs \$18 in silver, lead and gold. The Heller tunnel is in 327 feet with a winze 50 feet, in 5 feet of ore worth \$9 gold, copper and silver. The same company is running a tunnel on the Vassar group. The lower tunnel is in the ledge. The upper tunnel is in low-grade ore, no waste. It runs \$11 in gold, silver and copper; John Gray, superintendent.

The Oriental M. Co. at Providence owns twenty-five claims, including mill-site. The claims are in three groups. The tunnel on the Lottie is in 3300 feet and is to be 6000 feet, and will gain a depth of 1100 feet. Work has been suspended since last April, but the company is now making contracts for work. They will erect a mill at mouth of tunnel when completed. There are several miles of drifts in the property. This company is also operating the Postmaster group in Big Bug canyon, where they have a mill with thirty-five to forty tons capacity. Crushers and concentrators are used in the mill.

Poland, Feb. 9.

President C. J. George has made final payment on the McKinley and Vassar groups of claims, near Prescott, for the Poland Extension Co., near Phoenix. They have fifty men at work. A mill

will be erected for the reduction of ores of the Poland Extension and the two adjoining claims of the Gold & Copper Co., of which C. J. George is president. A gasoline hoist will be put in next month at the Fitzhugh Lee, one of the claims of the extension. On the Poland Extension proper a crosscut has been run 500 feet and from that point drifting done for 600 feet. The Extension Co. has eighteen claims in four groups. John Gray is superintendent.

At the Sloan mine, located in Grapevine district south of Yeager canyon, near Jerome, the Yeager Canyon C. Co. report having struck a body of ore carrying gold, copper and silver, at a depth of 800 feet.

Eighty stamps are dropping in the mill of the Congress mine, near Wickenburg, crushing an average of 300 tons daily.

CALIFORNIA.

AMADOR COUNTY.

At the Onelda mine, near Jackson, the shaft is down 2200 feet. A small hoist has been set up at the 2000 level, and the rock hoisted from below is dumped into skips and sent to the top by the regular hoist. The recent rains have necessitated three hours extra pumping daily.

CALAVERAS COUNTY.

The Lloyd gravel mine at Central Hill, 4 miles west of San Andreas, is being operated by F. F. Ames of San Andreas.

The Buffalo mine in Chile gulch, near Mokelumne Hill, has been bonded to D. M. Reardon of San Francisco for nine months for \$30,000. This property comprises 160 acres of patented land. There is a mile of gravel channel.

Manager F. F. Hammon of the Hammon & Carnduff Co., prospecting bonded ground in and along the Calaveras river, near Jenny Lind, says they will build a dredger and begin working the gravels.

EL DORADO COUNTY.

The El Dorado C. M. Co. has bought several additional mining claims near Georgetown.

An aerial tramway will be built by the Eureka Slate Co. from Kelsey to Placerville for transportation of slate from the Eureka slate quarry.

INYO COUNTY.

The Ratcliff mines at Ballarat, a group of twelve claims in Pleasant canyon, Panamint mountains, are reported sold for \$250,000 to Eastern men. One vein, 60 feet wide, is of milling ore. M. Garbut of Los Angeles is manager.

KERN COUNTY.

The Charter Oil Co., a lessee of the Queen, near Bakersfield, will resume, O. S. Hickey having a contract to deepen the well.

The Gilt Edge Oil Co., in Sunset district, will sink its well to 1700 feet, being down 1500 feet.

The New York-Pacific Oil Co. will drill in the San Emidio district, on the Los Lohos ranch, 7 miles southeast of Sunset.

MONO COUNTY.

In West Walker district, near Bridgeport, at the Cuban Prince mine, owned by F. Owens and R. Terry, they are driving a 100-foot tunnel — Owens will start sinking a shaft on the Blue Bird in April.

NEVADA COUNTY.

Superintendent J. C. Roberts, at the Peabody mine, near Grass Valley, has men at work timbering the drain tunnel. A holler will be put in and pumping started.

Several tons of ore, taken out by H. Harris & Co. from the shaft at the Union hill, near Grass Valley, 1000 feet below the main works, last week gave returns at the Orleans mill of \$13 per ton.

ORANGE COUNTY.

It is locally reported that a smelter is to be built at Newport, 8 miles south of Santa Ana, on the coast, with the intention of establishing a market for custom ores.

PLACER COUNTY.

The Peckham hill tunnel of the Big Channel Con. M. Co., in Snyder canyon, near Forest Hill, is in 400 feet, says Superintendent Ramsdell, and it is expected to cut the channel in 400 feet more.

G. Bisbee has a full head of water and is working his claims on point Lookdown and at Shenanegan hill, near Forest Hill.

PLUMAS COUNTY.

R. E. Carswell, secretary of the Cataract G. M. & P. Co., operating the Indian Bar Con. mine on the North Fork of Feather river, 3 miles below Rich Bar, Quincy, says the company has 10 miles of old canal along the canyon of Yellow creek to the North Fork, which will be repaired to carry water for hydraulicking. They have bought 800 acres of gravel channel.

Monitors will be used in washing gravel to the elevator being put in and an electric plant will be installed.

RIVERSIDE COUNTY.

W. Haarlo, Jr., president and manager of the La Crescenta M. Co., below Needles, on the Colorado river at Riverside mountain, says the company will put up a smelter at their mines.

SANTA BARBARA COUNTY.

The Loma Oil Co. of Los Angeles will begin drilling for oil on the Fox ranch at Graciosa next week.

SHASTA COUNTY.

The ending of the strike has brought many men to Keswick in search of work, when there has not been enough for the union and non-union men already there. The Mountain Copper Co. is not discriminating against the strikers, but is not reopening the smelter full blast. Of five furnaces only one has been blown in. The pumping plant, converters, foundry, machine shops, three brick machines and eleven rotary roasters are still idle; one railroad crew is running and no ore is coming down from the mine, and the smelter will not be in complete operation until shipments are made from the mine.

A strike of ore was made last week in the Central mine, in the Old Diggings district, near Redding, says Superintendent A. A. Anthony, in the lower tunnel. The ledge is 300 feet below the surface.

The general and assay offices of the Balakiala mine, near Kenrett, were destroyed by fire on the 9th inst., says Superintendent W. W. Adams. Loss, \$1000.

United States District Attorney Woodworth and Special Agent Pryor of the General Land Office are at Redding on business concerning the damage to Government timber by smelter smoke in the vicinity of the Mountain Copper Co.'s plant at Keswick. The company has assured the representatives of the Government of its readiness to meet every just demand upon a proper showing of the actual damage incurred. J. J. Pryor, the special agent, has recommended that the injunction suit be dismissed and that the Government take action to secure damages.

SIERRA COUNTY.

The Sierra Buttes mine, near Sierra City, has closed down and forty men are idle because the company refuses to discharge the boarding house cook.

SISKIYOU COUNTY.

A strike is reported in the Advance mine on the Salmon river. C. White, L. Michelson and J. Davison located the claim last July. They found the ledge in the face of a drift they were driving, and in three days time took out \$2800 with a hand mortar.

A strike of free gold ore was made last week in the drift in the Advance mine, on Chinagulch, in the Salmon River country, near Sawyer's Bar. The mine is owned by C. White, L. Michelson and J. Davison. They report having pounded out \$2800 in three days with a hand mortar. The Advance until recently was worked in open cuts, one of which is 85 feet deep. The ledge in the face of the drift shows 3 feet wide.

TRINITY COUNTY.

The report that the Bully Chooch mine has been closed down on account of a strike is incorrect. The plant was closed by reason of the last heavy storm. There is 10 feet of snow on Bully Chooch mountain, where the mine is located, and the ditch that furnishes the mill with water is frozen up. W. B. Gester, general manager, says that when weather conditions are such that he can proceed with the work he will do so with a full force.

The east end of the Unity M. Co. dam on the east fork of Stewart's fork, near Weaverville, went out during the recent storm. The dam was 40 feet high and built four years ago.

L. H. Willis reports a good clean-up on the Hansen ranch placer claim, near Weaverville, which he has been operating this winter. It is reported a prospector recently picked up a nugget worth \$408 near the mine.

A. Mansfield, operating the Gold Bug quartz mine on Karick gulch, near Weaverville, a quarter of a mile from the Mason & Thayer mine, says several prospect holes have been sunk on the ledge, uncovering a shoot of ore which assays \$60 per ton. The ledge is 20 feet wide with 2½ feet of pay. He is building an arrastra and also drifting under the old town of Canyon City, where he is finding coarse gold in paying quantities.

TUOLUMNE COUNTY.

The Ryan-Mackay copper mine, west of the Jumper mine at Stent, was bonded last week to the Payne Smelter Co. of San Francisco. The two shafts will be

unwatered to determine at which point operations can be best conducted. A hoist and other development machinery will be installed, the shaft widened to double-compartment and sunk 500 feet. The Sierra Railway Co. will run a switch to the mine from a point below Jamestown and bunkers will be erected. The ore carries values in gold and silver, as well as copper.

At the Longfellow mine, Big Oak Flat, a shoot of ore has been struck carrying \$30 per ton in gold, says F. H. Partington superintendent.

The Century G. M. Co. of West Virginia has bought the Gagnere quartz mine and millsite near Tuttle town. — L. Kahl has bought the Darrow one-third interest in the Beynon and Darrow placer mine on Mormon creek. — The Vivian mining claim has been bonded to W. S. Wilhelm for \$13 000, payable before Dec. 4 1905. W. S. Wilhelm has bonded the Concord quartz mine for \$10,000.

The mill at the Mount Jefferson mine at Groveland is shut down pending repairs, says Superintendent J. H. Gilmore.

YUBA COUNTY.

O. H. McConoughy, of Chicago, superintendent and owner of the Crystal mine, near Brownsville, has men at work reopening the mine.

COLORADO.

BOULDER COUNTY.

Manager C. F. Lake of the Boulder County M. & M. Co. at Cardinal, in the Grand Island mining district, 3 miles from Eldora, says it is planned to enlarge the mill to 100 tons daily capacity. Work will be resumed on the 3000-foot crosscut tunnel, which will cut the vein at a depth of 1700 feet. A compressor plant, machine drills and aerial tramway will be installed. The vein carries a shoot of smelting ore, with gold and silver. The average for the entire vein is \$10 a ton.

The Alaska tunnel in Ward district will cut the veins on the Utica Hill G. M. Co. claims at a depth of 1200 feet. The mouth of the tunnel is 3000 feet from the Utica Co. shafthouse. A body of high-grade ore has been cut, and the opening of the Utica by this tunnel will reduce the cost of mining by the Utica 45%, it has been estimated. Their ores are treated by cyanide.

A concentrating mill will be built at the Hooser at Sugar Loaf this spring to treat tungsten ore.

CHAFFEE COUNTY.

The Salida G. & C. M. Co., incorporated to operate the Sedalia copper mine near Salida, will install a 100-ton mill to treat the ore by leaching process, independent of the smelters.

CLEAR CREEK COUNTY.

Reiley & Haggart have opened up 3 inches of ore in their lease on the Egan on Democrat mountain, near Georgetown, which mills without sorting 250 ounces in silver per ton.

E. W. Williams has bought the Kohlnoor and Donaldson properties above Idaho Springs, including the Champion and Trio lodes and the mills and water power on Clear creek above Idaho Springs. Work has begun on the Trio through the tunnel, which will cut the Champion when driven 200 feet farther at a depth of 800 feet.

A body of high-grade ore has been opened in the lower level of the Sunhurst mine of the Red Oak Co., near Georgetown, in an upraise. This strike is 300 feet lower than the main level, where the upraise is connected between the main level of the Sunhurst and the Sceptre tunnel. The ore from the Sunhurst will be taken out that way to the tramway.

The Mendota mine and mill, near Georgetown, J. Old manager, says the zinc product for the last month equaled that of the concentrates of lead, silver and gold. Shipments are made daily from the mill. The zinc is shipped to the smelter at Canon City.

At Yankee, Manager Seeman of the Yankee Con. M. & T. Co. in driving a tunnel on their Lomhard extension claim 1500 feet below the upper tunnel to prospect for the Lomhard-Polaris vein, cut the ore body at 110 feet last week. With this additional find the company will increase its milling facilities.

CUSTER COUNTY.

E. Morrison, working a group of claims 12 miles southeast of Westcliffe, on Look-out mountain, in Boneyard park, says on one of the claims he has opened a 7-foot vein between schist walls which carries uranium at a few feet depth from the surface.

There are 100 men at work in and about the Bassick mine, near Querida. Manager A. W. Warwick says a new ore body has been found in the 1600-foot level, carrying gold and silver values. A cyanide

mill and an electric-light plant are being installed.

FREMONT COUNTY.

The shaft of the coal mine at Rockvale has been repaired and operations resumed. The entrance of the emergency outlet is being cleared.

GILPIN COUNTY.

Shull & McLeod, working the El Dorado mine at the head of Leavenworth gulch, near Central City, are taking out smelting ores from a depth of 100 feet, which assay \$70. They are shipping milling ore.

Manager M. D. Draper reports finding free gold ore in the 330 foot west level of the East Notaway mine, near Central City, which is being worked by the Town Topics G. M. Co. Regular shipments are made to the smelter at Golden.

A Nevada mine company will operate the Ute mines on Quartz hill under a lease and bond to T. and J. Chappel, J. and K. Eva, A. Curnow, N. Tregear and J. Trembath. The main shaft is down 400 feet.

The Brooklyn mine, near Lake View, south of Central City, has resumed. From the bottom of the shaft down 600 feet crosscuts will be driven north and south. The property is being worked by R. Cleary of Denver, the owner, with J. Faulkner, superintendent.

The West-Calhoun and Jefferson mines in the Quartz hill and Russell gulch district, have consolidated. The property is controlled by the Gold Mining Investment Co. and will be cut by the tunnels now being run in from South Clear Creek, at depths of 2000 to 3000 feet.

The water is being lowered in the Bates-Hunter mine on Bates hill in Gregory district and a number of sub-lessees will begin work in the lower levels. Other lessees are at work above the 300-foot levels, and they are taking out smelting ores as well as ores for amalgamation. The group is operated by H. Becker, under a lease from the Eastern owners.

Russell Gulch parties are working the Gem property on Quartz hill and taking out ores from a depth of 150 feet. A recent shipment gave values of five ounces gold per ton. Among the regular shippers in this district is the Hamlet, worked by the Hillside M. Co. under a sub-lease. Ores are taken out from three levels, both of milling and smelting grades.

During the last week of January there were shipped from the Black Hawk depot of the Colorado road 111 cars, or 2220 tons of smelting and crude ores, tailings and concentrates, making a total of 361 cars, or 7220 tons for January, and in comparison with the same month of 1902 an increase of 1200 tons.

The St. Louis-Justice mine in Lake district is being operated under lease by Valero & Co. of Colorado Springs, and they have sunk the shaft to 700 feet. On the 500 and 600-foot levels they are taking out both milling and smelting ores, the last lot of smelting grade going three ounces gold per ton at the sampling works.

Leidinger & Co. are taking out surface ores from the west end of the Prompt Pay mine in Russell district, and it is being sent to the stamp mill.

Manager J. McMillen of the Ann Rutledge G. M. Co., operating the North Star mines in Vermilion district, 6 miles west of Central City, says the North Star shaft, through which the group will be worked, is down 150 feet and will be sunk to 400 feet.

The Colorado & Tellurium M. Co. have a lease and option on the Freedom and Bueno mines in Gregory district for three years for \$35,000. W. W. Emmett is superintendent.

Denver and Eastern men interested in the Ann Rutledge G. M. Co. have resumed operations at the North Star group in Vermilion district, 6 miles west of Central City. The shaft, down 125 feet, will be sunk 300 feet deeper this winter and other development work done. J. McMillen is superintendent.

C. Pishon and D. Zancanella, working the Traction mine on Missouri flats, near Russell gulch, at a depth of 100 feet made a shipment last week of 1½ cords to the Gilpin mill and have a shipment of sulphide ore to send to the sampling works.

GUNNISON COUNTY.

The Maid of Athens, near Pitkin, is shipping regularly. A 500-foot tunnel reaches the ore body, which is being worked in both directions.

The Beaver M. & M. Co., operating a group of claims on Cameron mountain, in Tincup district, are shipping. The upper workings show a strong vein of ore which assays \$15 in gold, says J. W. Carpenter, superintendent and manager.

The Wilkinsburg M. & P. Co. is operating in the Last Chance gulch in the Gold Brick district, near Gunnison.

T. Sharpe is developing the Calumet lode above Ohio City, and last week shipped ore averaging \$60 per ton, gold.

The Homestake group in McIntyre gulch, adjoining the Cortland mine, is being developed by S. M. Tarkington, et al., of Ohio City.

The Golden Age group, owned by M. Kelleher at Vulcan, has opened up in one claim a 5-foot vein, between schist and porphyry walls, and carries copper oxides with \$5 in gold and a few ounces silver per ton.

HINSDALE COUNTY.

(Special Correspondence). — The new shaft being sunk on the Ute & Ulay is down 375 feet, the contract calling for 400 feet, when a sump 20 feet deep will be sunk, a station cut at 400 feet and drifting commenced.

The Red Rover mill is running steadily, turning out a good grade of lead concentrates, which are shipped to the Salda smelter. This is a Boston company. D. A. Farrell is manager.

The owners of the Isolde, in Burrows Park, have a bond and lease on the Inez & Hollister, adjoining their property. Rich ore has been mined from the Isolde and considerable shipped from a small stope near the surface, which was worked up to the side line. The vein passes into the Hollister ground.

The Hidden Treasure Co., near Henson, are developing and blocking out ore, but owing to cold weather and shortage of water their 100-ton concentrator is idle.

The concentrating mill of the Henson Creek Lead Mines Co., near Capitol City, is nearly completed, but will not be run until spring. P. T. Hewitt is in charge.

Watkins & Kilvert, who have a lease on a block of the Golden Fleece, also on the mill of the same company, are running the latter whenever they can get ore hauled from the mine. The roads are in bad condition.

Mr. DeRemer, inventor of the De Remer water wheel, recently inspected the power plant of the Red Rover Co., where one of his wheels is in operation, and made some changes in the nozzle, increasing the power materially. The Tobasco Co. at Sherman also have De Remer wheels in their plant.

The Hotchkiss Mountain M. & R. Co., owners of the Black Crook group on Hotchkiss mountain, have twenty men employed on development work.

Lake City, Feb. 7.
The Inez-Hollister group in the Burrows Park district has been bonded to the Dupre G. M. Co. of Lake City for \$80,000. This secures to the Dupre Co. the ground through which the Isolde vein may be reached at depth. Development continues on the Isolde, but with the opening of spring more men will be put on and the Inez tunnel driven ahead and made the main working tunnel.

HUERFANO COUNTY.

The Hesperus G. & C. D. Co. has incorporated at Walsenburg; F. E. Clary, J. B. Hawes, A. M. Nye, F. W. Kinney. M. Bird, of Walsenburg, is manager. The company will develop property in the Ojo and Blanca districts.

LAKE COUNTY.

From the Morocco shaft of the Home Extension M. Co., near Leadville, Manager A. M. Galles is shipping two carloads a day of manganese, which nets them \$3 per ton.

H. C. Burlett, operating the Hopkins mine on Mount Sheridan, is taking out lead ore which he is storing and will begin shipments in the spring.

The lead-zinc sulphide dump of the R. A. M., near Leadville, is being shipped to the Empire Zinc Co.'s works at Canon City at the rate of seventy-five tons per day. A large tonnage is also coming from the mine, principally zinc sulphide shipped to Belgian smelters.

MINERAL COUNTY.

Operations have begun on the Union group, owned by the Captive Inca Co. at Creede, and Manager W. Boyle has men sinking a new shaft north of the United Mines and on the Amethyst vein. The shaft will be sunk 600 feet.

OURAY COUNTY.

The Newshy M. & M. Co., near Ouray, is opening up a body of high-grade ore near the breast of the 1600-foot tunnel. Shipments will be resumed. All the low-grade ore from the Newshy is being placed upon the dump pending the building of a mill.

SAN MIGUEL COUNTY.

The management of the Alta M. Co., near Telluride, has issued a statement showing the production of the Alta mill for the past five months. The mill produced 1610 tons of concentrates of an average value of \$33 35 a ton. This output will be doubled after March 1. The value of the ore, 1609 tons, was \$53,666 at the mine.

Lessees White and B. Chadwick, on the Blue Lake mining claim in Bridal Veil

basin, near Pandora, are driving a tunnel on the Blue Lake vein, being in 160 feet. They have opened up 18 inches of gold and silver ore, assaying \$200. A vertical depth of 60 feet from the surface is attained by the tunnel. The Blue Lake group comprises seven claims.

SAN JUAN COUNTY.

The Golden Eagle mine, near Eureka, is bonded to F. S. Shaw of Chicago for \$60,000.

The Pearl mine on North Mineral creek, 5 miles from Silverton, has been leased to T. W. Miles, M. A. Tenny et al. of Denver. The property is developed by a 240-foot crosscut and drift, which opens up two shoots of silver ore aggregating 13 inches in width.

The Big Five M. Co. is receiving bids for the driving of 1000 feet of tunnel on their mines near Howardsville. On the Union, which heads north from Howardsville into Tower mountain, 500 feet will be driven, and the other 500 feet will be run in the new tunnel heading east into Galena mountain.

The lower tunnel to cut the Champlon vein on Sultan mountain, near Silverton, is in 760 feet. Patterson & Johnson are the owners.

J. D. Wells, operating the Pearl mine in Shofly basin, a mile from Burro bridge, near Silverton, has opened up the vein with a 200-foot crosscut and drifted on it for 50 feet. The vein shows two streaks of ore, 4 inches wide and 9 inches wide, carrying silver, zinc and gold.

SUMMIT COUNTY.

The Mono group of three claims on Mineral hill, near Breckinridge, owned by J. Miller and F. Brown, is in ore. The vein was cut after running a crosscut 400 feet, opening up a body of lead, gold and silver.

The Marcelle M. & M. Co., near Montezuma, is driving its tunnel both north and south on the vein cut last month. On the north drift, where it is supposed to be barren ground, two streaks of smelting ore are showing in the face and they are approaching each other.

TELLER COUNTY.

Lessee Darnell, operating on the War Eagle mine, Cripple Creek, reports a strike 4 feet east of the main vein and beneath the shaft house. A drift has been run on the ore for a distance of 15 feet, and ore averaging \$30 to the ton opened up. A winze has been sunk from the 60-level in ore.

M. Hoskins et al. have a lease on block 16 of the Roxanna mine, Cripple Creek district. Patton Bros. have a lease on the North Star block of the same company. Lessees on the Climax No. 1 of the Little Puck Co. are sinking and drifting with machine drills, and ore is being saved from both shaft and drifts which assays \$25.

The Last Stake G. M. & L. Co., adjoining the Gold Coin, Cripple Creek district, has its shaft down 600 feet and cutting a station, after which crosscuts will be started.

H. L. Niedringhaus, manager of the Hilderbrandt G. M. Co., owning a group on Grouse mountain near Cripple Creek, says he will install a plant of machinery. The shaft is down 400 feet and development will be extended. Pay rock has been found on several levels of the mine.

N. Ostron & Co., leasing on the Ramona on Bull hill, Cripple Creek, report the old workings having opened a new vein, showing 2 feet of \$40 ore.

Hoisting ore has begun through the new three compartment shaft of the Zenobia mine of the Stratton-Cripple Creek M. & D. Co., on Bull hill, Cripple Creek, says Manager W. G. Rice.

The Hanover Co. has granted a two years' lease on the Hanover mine on Bull hill, Cripple Creek, to Deadwood men, and G. W. Tynan of Independence, Colo., is superintendent. A shaft will be sunk to 200 feet.

Nine sets of lessees are operating the Acacia ground at Cripple Creek. Lessees Wyatt & Sharp, on the Morning Star, last week made a shipment of ten tons of three-ounce gold ore from the Pinnacle vein in the 250-foot level east of the shaft, the values being principally in the screenings. They have opened the junction of a small rich vein that crosses the main vein at that point. The lessees on the Robinson shaft have taken out forty tons of pay rock from the Fitch & Robinson vein in stoping above the 80-foot level, where 1 foot of ore assays four ounces. Lessees Rogers & Mullins, operating in the old shaft this week made a shipment of \$40 ore from the 200 foot level. Lessee McKinsey, on the south end of the Burns claim, has stopped drifting and is extracting ore from the Shurtloff vein, where he has proved up a shoot for 65 feet.

During the month of January the shipments from the Pharmacolite mine, on Bull hill, Cripple Creek, amounted to 200 tons of ore that averaged \$30 per ton. The

property is being operated by four sets of lessees, all of whom are shipping.

Wilder & Co., operating on the Jerry Johnson, on Ironclad hill, Cripple Creek district, shipped a total of 125 tons of ore during January that averaged \$70 per ton in gold. The ore is principally from the 300 level.

H. M. Booth has taken a lease on a portion of the 500-foot level of the Granite mine on Bull hill, Cripple Creek.

An experimental cyanide plant of ten tons daily capacity will be erected on the property of the Boston & Cripple Creek Co. on the northeast slope of Tenderfoot hill, Cripple Creek district, by W. Kirk of Denver.

The Mohawk Belle, on Raven hill, Cripple Creek, has been bonded and leased to Denver men, with R. M. Leshar as superintendent. A lease has been granted on the southern 450 feet of the War Eagle claim on Bull hill to the Gold Cord Co. They are putting in machinery. Work will begin in the 80-foot shaft. The Blue Flag Co., operating the Blue Flag claim on Raven hill, have begun upraising preparatory to enlarging the shaft.

Grant et al., operating the Currency group between Beacon and Guyot hills, Cripple Creek district, have struck ore at a depth of 85 feet, showing 18 inches width.

A steam plant is being installed on the Henry Adney claim on Beacon hill by lessees M. V. Burk et al. They intend to cut the extension of the C. K. & N. vein.

Wyncoop et al., on the Little Besse claim on Beacon hill, have their shaft down 225 feet and will continue to 400 feet, at which depth the lessees expect to crosscut for the El Paso vein and ore shoot.

Four new leases were granted last week on the Trail claim on Battle mountain, Cripple Creek district, belonging to the United Mines Co., to L. W. Rope, P. Wilson and N. Edwards, who secured two blocks adjoining.

Manager J. K. Bruner of the Sand Burr G. M. & M. Co. of Kansas City, owning 140 acres of patented ground at the junction of Oil and Four Mile creeks, north of Gillett, says they are driving a tunnel to cut a mineralized dike opened at the surface, and are in 1195 feet. The ore is of low milling grade and will be cyanided. They expect to cut the vein at 1600 feet. It is planned to build a mill on Four Mile creek, which would furnish the power. The company has a steam power plant installed and is generating its own electricity, using an electric drill in the headings.

The Federal Mines Co. has bought the extension of the Blizzard claim, and also the Saturn, of the Gold Dirt district. The company will cut the extension of the Gomez, Lexington, Blizzard and the Iron Crown vein.

L. W. Terrell & Co. have taken a lease on the Kittle Wells on Tenderfoot hill, Cripple Creek district, and will install a cyanide plant.

The daily output of the Portland mine at Cripple Creek is 250 tons. With the exception of a little high grade it is all treated at the company's mill at Colorado City.

The Sitting Bull of the Keystone Co., near Cripple Creek, is being worked under lease to Kinsle & Co. There is a shaft 350 feet deep on the property.

F. Johnson is putting in cyanide tanks to handle the tailings of the Gillett mill. He says the material will average \$7 per ton.

Sinking is resumed in the three-compartment shaft of the Delmonico at Cripple Creek, on Bull hill, owned by the Union Co. and operated by leasers. They are down 200 feet and will go to the 500-foot point. Ore shipments continue.

The lessees operating the Beacon hill ground of the Old Gold mine, Cripple Creek, are down 200 feet.

C. Perkins, operating on the Compromise mine, Bull hill, Cripple Creek, at a depth of 35 feet struck two veins that cut through the blanket vein, from which ore has been taken, both from that property and the Deadwood, adjoining. The shoot occurs at the junction with the blanket vein.

Sullivan & Jamieson, leasing on the Bison claim of the Free Coinage Co., Cripple Creek, have opened an ore shoot at a depth of 25 feet that is 2½ feet wide and averages \$50 per ton.

The St. Louis M. Co., operating 3 miles south of Cripple Creek, has found an ore body in the shaft at a depth of 200 feet, says Manager P. Lahey.

The Economic mill at Cripple Creek completed its annual cleanup last week and has resumed regular treatment. The mill is handling 150 tons a day, the bulk of which comes from the mines of the Woods Investment Co. Aside from the output of the War Eagle mine little custom ore is treated.

The Taylor & Brunton sampler at Cripple Creek reports more ore in sight

than for many months. This plant is handling on an average 600 tons of ore every twenty-four hours. The value of the ore handled by this plant the last three months has shown an average value of \$41.30 per ton.

L. W. Tirrel & Co. have taken a lease on the Kilty Wells on Carbonate hill, near Gillett. They have a large body of low-grade oxidized ore and will put in a cyanide plant.

G. Hummer, operating through the Sweet shaft of the Gold Bond Co., on Gold hill, Cripple Creek district, is shipping 100 tons of ore per month that averages \$4 per ton gold. The ore is being broken in the first and second levels from a 2-foot shoot.

The El Paso Con. Co. have begun driving on the drainage tunnel from the south drift at the depth of 600 feet in the old shaft with three shifts. The company is driving from four headings in the tunnel. The shaft sunk to 50 feet is finished and driving started both ways from the bottom. In the El Paso a bulkhead has been placed north of the new working shaft, so that pumping will not be necessary to handle water from the drive being made south to connect with the drift below. The deeper shaft is down 225 feet.

IDAHO.

BLAINE COUNTY.

W. G. Page, manager Croesus mine, in the Wood River district, near Halley, has twenty men at work and will sink another shaft and put up a hoisting plant.

CUSTER COUNTY.

A body of ore has been struck in the Albert tunnel on the White Knob Copper Co.'s mine at Mackay, giving assays of 15% in copper, says Superintendent W. H. Cox. The smelter will be blown in in the spring. The electric road connecting the mine and smelter is at present blocked with snow.

SHOSHONE COUNTY.

The Powhatan M. Co., operating a silver-lead property on Big creek, east of Wardner, has decided to sink a shaft on the vein. At present men are drifting on the leads along the hanging wall from the lower crosscut tunnel and a crosscut exposed 16 feet of concentrating ore.

A 10-stamp mill will be installed at the Ozark group of mines, near Pierce City. The Ozark and Red Cloud groups, 3 miles northeast of Pierce City, are under bond to L. H. Prather and C. S. Jennings of Spokane, Wash., with J. J. Wieland, J. T. Penn and Eastern men. A 3-mile ditch will be built.

E. C. Young, secretary of the Silver Cliff copper mines on Stevens peak, near Wallace, says several of the companies in that district will jointly buy a diamond drill outfit to prospect their properties.

MICHIGAN.

HOUGHTON COUNTY.

The Osceola mine, near Houghton, has fifteen drills in operation from No. 5 shaft. The Kearsarge branch is running full time.

Sinking in the exploration shaft on the Abmeek, between the North Kearsarge and Mohawk mines, near Houghton, has been suspended temporarily at a depth of 100 feet. Explorations will continue from the bottom of the shaft with jumper drills. The Abmeek is controlled by the Bigelow Syndicate, and this work is being done to locate the Kearsarge amygdaloid.

The Mass mine, near Houghton, is opened on the Evergreen and Butler lodes, and the Adventure mine adjoining is opened on the Knowlton and Merchants' lode. The production of the Mass mine for the last two weeks of January was: Average of rock stamped per day, 462 5 tons; average mineral obtained, 6 9 tons; average per cent, 1.483. The ore also contains silver.

Shipments of refined copper from the Lake Superior district average over 300 tons daily. All the smelters in the district are handling an increased tonnage and none of the mines are accumulating stocks of refined copper. The activity in the smelting industry and the volume of shipments by rail indicate a good demand for copper.

All the railroads entering the Lake Superior copper country have entered into a joint tariff of 35 cents per hundred on copper consigned to Milwaukee or Chicago, a reduction of 15% to 20% from the former rate, and will tend to increase rail shipments.

The third head of the Champlon mill, Houghton, is in operation and the fourth head of the Baltic is released, the Baltic mill running full capacity on Baltic rock.

The eighth furnace was placed in commission at the Calumet & Hecla smelter the first of the month.

The Miswabik Development Association has been organized at Lake Linden to develop 600 acres of land 1½ miles from the

Mohawk. The property is said to carry the same lode as the Mohawk. The officers are C. Smith, J. Bosch and A. Guck.

At the Champlon mill of the Copper Range Con. Co., near Houghton, two heads are being run tandem, the low pressure head being compounded with the adjacent high pressure head. This is said to be the first experiment of the kind tried at the lake mines.

A 1400 H. P. engine has been set up by the Calumet & Hecla, at Houghton, to drive the generator which will furnish electric power for the new stamp mill. The motor for driving the 60-foot sand wheel is of 700 H. P.

MONTANA.

BEAVERHEAD COUNTY.

The Tombstone M. Co., which recently bought a group of claims in the Vipond district, near Dillon, will put up a 10-stamp mill.

G. Knapp and M. Shaffer are leasing on the Midnight mine, near Argenta. The mine has a shaft 300 feet deep and in the workings the leasers have struck two bodies of gold ore. In one the ore shoot is 18 inches wide and the other 2 feet, and they are taking out twenty sacks a day.

FLATHEAD COUNTY.

A controlling interest in the Flathead-Rambler M. & M. Co., owning mines on Grouse mountain, 8 miles south of Troy, has been sold to Grand Rapids, Mich., men. C. W. Taylor is manager and J. Tholke superintendent. Manager Taylor says hoisting machinery and a concentrator will be installed. The ore carries lead, silver and gold values. There has been 1000 feet of development in tunnels and shafts.

GRANITE COUNTY.

C. J. Smith, president the Montana G. M. Co. mines, 12 miles from Flint, shipped last week a retort of gold weighing 100 ounces, the result of a six days' run with a small Huntington mill at the Sunday mine. The company has taken up its bond on the Sunday claim for \$20,000. It is the intention of the Montana G. M. Co. to increase its ore crushing capacity.

MEAGHER COUNTY.

At the Copperopolis mine at Copperopolis, near White Sulphur Springs, Superintendent W. W. McDowell has pulled the pumps and abandoned the mine, acting on orders from the company.

MISSOULA COUNTY.

The Pennmont G. M. Co. has incorporated at Missoula, C. H. and F. C. Van Slorch, E. A. Clark of Scranton, Pa., and T. S. Letterman, L. J. Knapp of Missoula, to operate placer mines near Lolo and four quartz claims near Nine Mile.

The Oro-Monarch G. M. Co., operating near Deborgia, propose to install a 100-stamp mill in the spring, says Manager Wing.

PARK COUNTY.

D. L. Wing says he will work the placers of Emigrant gulch, near Chico, with steam shovels and dredgers.

NEVADA.

ESMERALDA COUNTY.

W. Grozinger, owning coal lands 19 miles southeast of Candelaria, has let a contract to sink a shaft 200 feet below the lowest workings.

HUMBOLDT COUNTY.

J. A. Lathrop of Boston, Mass., reports having an option on the Rye Patch mine, near Lovelock.

LINCOLN COUNTY.

(Special Correspondence)—The Keystone mine, Yellow Pine district, was in the early nineties a producer, but the ore body was lost and the property supposed to have been worked out. In May, 1901, C. Anderson examined the property and recommended work which resulted in the discovery of a new ore shoot. Sixty thousand dollars was produced during the latter half of 1902 with one 5-foot Huntington mill. A new hoist has been installed and a new shaft is being sunk, now completed to the 200-foot level. A large ore bin has been built at the mine and the mill, which has been shut down since December 15, owing to necessary delay in using the old hoist while the new one was being put in place, will be started the latter part of February.

Sandy, Feb. 5.

G. E. Oils has bought the Little Brown Jug mine, near Searchlight. This claim parallels the Cyrus Noble on the south.

At the Mendha, near Ploche, Superintendent T. J. Osborne is opening up the ledge, which averages \$30 in gold.

LYON COUNTY.

The Douglas M. & S. Co. is incorporated

to operate the Douglas group of mines, near Yerington. A. B. W. Hodges of San Francisco, Cal., is manager. Development machinery will be installed.

NYE COUNTY.

The Tonopah M. Co. at Butler has its Siebert shaft down 600 feet. The drift on the 300 level, connecting the Siebert with the Desert Queen, is completed. The Queen shaft has cut through 24 feet of ore running \$40 per ton. A station has been cut at the 614 foot point. On the east 500 level of the Mizpah ledge the ore body is 12 feet wide, value \$80 per ton. A winze has been started on the east 300 level, which is opening up 6 feet of \$80 ore. In the east and west drifts at the 340-foot level of the Valley View the ledge is 6 feet wide.

The New York-Tonopah M. Co. at Butler have resumed sinking from the 500-foot point and will go to 1000 feet.

The power question at Butler is to be settled by the bringing in of 6000 H. P. from Owens river by electric transmission—a distance of 80 miles from Tonopah. There are forty shafts being sunk in and around Butler.

At the Montana-Tonopah, near Butler, the high-grade ore in the bottom of the shaft has widened to 5 feet on the north side. The north drift at the 400 level is in pay ore. Sinking continues at the rate of 2 feet per day. The first carload of ore was shipped this week.

At Stone Cabin, near Butler, they are drifting and crosscutting on the 300 foot level. Sinking will be resumed. The two-compartment shaft at the Rescue is down 25 feet. Last week several stringers of ore were cut in the shaft of the Midway, down 225 feet.

At the Halifax group, owned by Kelth & Kearns, the hoist is in operation.

The Indiana-Tonopah Co. is sinking a two-compartment shaft on their Owl claim, near Butler. The group consists of sixteen claims.

The main shaft on the Rescue Co.'s mine, near Butler, is down 100 feet and in porphyry. Several quartz stringers in manganese gouge and carrying values have been cut.

The hoist at the shaft of the West End mine, near Butler, is in position and sinking resumed at the 220-foot point, and will go to 1000 feet deep.

The shaft of the Tonopah & Great Western M. Co. at Butler is down 135 feet. Machinery will be put in and further development begun.

STOREY COUNTY.

At Virginia City Superintendent J. R. Ryan says that at the Con. California & Virginia the total extraction of ore for the week ending Feb. 7 was 163 cars, assaying on a basis of gold value \$14.20. At the best & Belcher, at a point in the south drift 100 feet south of the raise, a west crosscut was started and extended 20 feet through porphyry.

NEW MEXICO.

SIERRA COUNTY.

J. B. Taylor has recently completed a contract of crosscut work on the Emporia mine at Grafton. B. S. Phillips, having an option on the property, will put up a mill.

T. Scales has men at work driving a tunnel to cut the Confidence vein in the Cuchillos.

TAOS COUNTY.

L. Rogers, of Waco, Tex., and H. J. Luce, of Red River, have taken up their bond and lease on the Jayhawk group of mining claims at Red River. This property consists of three patented and two unpatented claims. The Jayhawk has a 100 foot tunnel, 100 feet of crosscut, one shaft 45 feet and another 50 feet deep. The lead is 27 feet wide and gives mill returns of \$12 per ton in gold. The National has a 150 foot tunnel with a 7-foot lead. The Palo Alto has a 60-foot tunnel, and the Buena Vista a 40 foot shaft sunk on the lead which runs \$7 per ton. The Jayhawk G. M. Co. has, under the new management, bought the June Bug mill, 4 miles from the Jayhawk mine.

OREGON.

BAKER COUNTY.

A body of milling ore has been opened on the Midway group, recently bought by the Midway Con. G. M. Co., near Sumpter. The ore is in a blind lead, which was cut while drifting on the Midway or Anululu vein. The crosscut shows the ore body 22 feet wide, assaying \$6 per ton, says Manager Hendryx.

The Listen Lake Co. has a quantity of copper ore on the dumps of its Iron Dike claim, near Sumpter, ready for shipment, says Superintendent F. O. Bucknum, and as soon as the smelter is ready to receive ore they will ship. The Iron Dike shaft, at a depth of 30 feet, shows ore assaying 10% copper and \$8 gold. Recently the

company bought the McNamee gulch placers, five claims, and 300 inches of water for power. The placer work will be a side issue.

Operations will be resumed in the E & E mine, near Bourne. A contract has been let for driving a 450-foot drainage tunnel. Shafts and tunnels will be retimbered, and pumps, hoisting and sinking machinery put in.

F. D. Smith, manager of the Snow creek mines in the Greenhorns, near Sumpter, says the crosscut tunnel is in 650 feet. An upraise has been made, connecting with a new shaft. The face of the tunnel is 225 feet in depth from the surface.

The Constellation M. Co., which owns a group of mines at Cable Cove, 14 miles north of Sumpter, has reorganized as the Constellation Con. M. Co. J. Higgins of Cambridge, Md., is manager. It is intended to sink on the ore shoot developed and block out reserves before the erection of reduction works. The ores are a concentrating proposition, assaying \$15 in gold.

A cave occurred at the Columbia mine on the 5th inst. which will close down the mine for sixty days. As the morning shift was changing, the cage with the men had reached the top of the shaft when the main shaft caved for 200 feet from the collar down.

DOUGLAS COUNTY.

The Continental G. M. Co. has incorporated to develop and operate the Continental mine in the South Myrtle district, near Myrtle creek.

GRANT COUNTY.

Work will be resumed on the Climax group, 3 miles north of Granite, owned by the Eastern Oregon G. M. Co. of Spokane, Wash. Superintendent W. Wade of Granite will put in air pipes and machinery required to ventilate the crosscut tunnel, now in 300 feet and which will be driven 300 feet farther to strike the main vein.

The Scandia tunnel, on the north slope of Quehec mountain, near Alamo, is in 2160 feet and being driven with hand drills. It is the intention to continue until they cut the veins proven on the surface or run the entire 3000 feet allowed as a tunnel site.

JACKSON COUNTY.

N. Herbert, operating a quartz property near Gold Hill, in Water Gulch district, has opened up a shoot of free gold ore, 18 inches wide.

Hillis Bros. are operating their hydraulic mine in Pleasant Creek district.

The Opp mines, 1 mile from Jacksonville, have been sold to Eastern men, with W. de Warlia as manager, for \$150,000. A 40-stamp mill is to be installed as soon as the mines are opened up. The Rogue River Valley Railroad will run a branch from Jacksonville to the mine.

It is reported that the Bouden mine, near Gold Hill, will resume. S. McClenodon and L. F. Jordan, controlling the mine, have bought the Braden stamp mill and equipment on Rogue river, opposite Gold Hill, for \$10,000.

N. Herbert, who recently bonded the E. Ray mine, near Gold Hill, sank 50 feet in the old shaft and reports a 19-foot vein, 2 feet of which is rich in gold and tellurides.

JOSEPHINE COUNTY.

In the northwestern part of the county the St. Helens & Galice M. Co. are working on Dutch Boys bar, near Galice, gravel that prospects 50 cents to the pan, says Superintendent A. B. Cousin. This company owns and is operating, by hydraulic, 300 acres of placer ground, on the upper part of Galice creek on both forks.

SOUTH DAKOTA.

CUSTER COUNTY.

The White Cloud G. M. Co. has incorporated at Custer; J. A. Collins, J. E. Pitcher and A. Wilcox. The company has twelve claims 4 miles north of Custer, on Laughing Water, southeast of the Gold Fish group.

Superintendent D. Hensault of the Crown mica mine, near Custer, has resumed operations and is getting out mica for shipment.

The Extreme M. & M. Co. has organized to operate the Golden Mortar, Provo and London groups. It is intended to build a plant on the London group, 3 miles from Custer, the process to be either cyanide or chlorination. J. N. Wright of Custer is manager.

The Interstate G. M. & M. Co. has begun development of its mines, adjoining the Roosevelt group of the Grantz Co., near Custer. T. F. McLaughlin is superintendent.

A carload of mica a month is the output of the Black Hills Porcelain, Clay & Marble Co., operating near Custer.

LAWRENCE COUNTY.

At the Tykoon mine, near Deadwood,

the shaft is down 115 feet and a station is being cut at 100 feet. A crosscut to the lode will be driven. G. Bertschy is superintendent.

Work is resumed at the Titanic mine, near Carbonate camp, west of Deadwood. Machinery will be put in at the shaft, consisting of air compressor and pump. The company owns 1000 acres of land and will explore the quartzite measures. The shaft is 280 feet deep and drifting begun in the quartzite.

The Jupiter M. Co. has bought the Gustin mines, in Blacktail gulch, near Deadwood. The company is installing a cyanide annex to the Minerva mill, which they have bought. The capacity will be 125 tons daily. J. W. Douty of Colorado is mine superintendent. The material in this mine is gold-bearing conglomerate.

An air compressor will be put in by the Big Four M. Co. in their shaft on Deadwood gulch, 4 miles above Deadwood. The company is working in the phonolite belt and has opened up a high-grade ore body. A mill will be built in the spring. The company is composed of Hamburg, Iowa, men.

The Cleopatra M. Co., R. B. Hughes superintendent, will put in an air compressor and machine drills at the mine on Squaw creek, near Deadwood.

The Hidden Spanish Co.'s property, near Brownsville, south of Deadwood, is being developed, with E. H. Darrows superintendent.

The Glover G. M. Co. is setting up a steam hoist and pump at the shaft on Nevada gulch, 2 miles east of Terry. The shaft, 370 feet deep, shows ore that assays \$11. From the bottom of the shaft is a crosscut in 10 feet. It is the intention to continue the shaft and at the 500-foot level drive another crosscut.

The cyanide plant of the Horseshoe M. Co. has a capacity of 1000 tons daily. Ore will be delivered from the mines by aerial rope tramway.

The reduction plant of the Hidden Fortune G. M. Co., 3 miles below Deadwood, is completed. It is arranged for amalgamation and cyaniding. The stamps weigh 1050 pounds each and the plant has a capacity of 300 tons per day. The pneumatic cyanide process will be used. The power is sufficient for a 600-ton daily capacity and it is expected to utilize it to this extent in the spring, says Director H. J. Mayham of Denver, Colo.

PENNINGTON COUNTY.

At the Inca mine, near Mystic, J. Harrington has men drifting on a vein of smelting ore at a depth of 250 feet.

The Fraternity G. M. Co., near Hill City, are sinking the main shaft and are down 100 feet.

The Deer Creek group, 18 miles west of Rapid City, is being developed by J. Keenan and M. Maguire of Rapid City. Nine shafts have been sunk, all of them in ore, some free milling and others of smelting grade, the latter showing values of \$25 a ton. There is one body which is copper pyrite.

R. M. Maloney of Deadwood, of the Maloney Blue Lead C. M. & S. Co., says a copper smelter will be built on their property in this county, near Sheridan.

TENNESSEE.

POLK COUNTY.

Manager R. Adams of the Tennessee Copper Co. at Copper Hill, reports for the fiscal year ended Dec 31, 1902, as follows:

Profits from royalties, merchandise department, tolls and copper production.....	\$303,012
Expenses for bond issue discount, bond issue reserve interest and discount and depreciation.....	71,903
Balance.....	231,109
Add last year's profit.....	55,725
Total profit and loss surplus.....	286,834

The production for the year was 8,103,534 pounds fine copper, in the form of pig and ingot. Sales: Pig copper, 4,349,487 pounds at 10 71 cents net; 866,079 pounds ingot copper at 11 12 cents.

UTAH.

The month of January in the ore and bullion market for Utah closed on settlements aggregating \$2,036,810, the settlements for the corresponding period in 1902 amounting to \$1,138,356, notwithstanding the heavy weather and the reported lower values in some localities. This is exclusive of the tonnages of bullion forwarded by the independent smelters to the Eastern refineries.

BEAVER COUNTY.

(Special Correspondence).—J. M. Callow has been engaged to make the designs for the 1000-ton concentrator and power plant for S. Newhouse's Cactus mine. J. Dedrichs is the contracting engineer. Frisco, Feb. 8.

Manager Farnsworth of the Horn Silver reports the mill at Frisco crushing 140

tons ore daily, with usual tonnage of copper ore marketed.

P. A. Franklin of the Blackbird M. Co., in Copper gulch, near Frisco, says sinking will be resumed in the triple-compartment shaft, now down 280 feet.

The Utah Southern Co., in Beaver Lake district, is running a crosscut for the vein at a depth of 122 feet and expects to cut it in 15 feet more, says F. A. Earls, manager. There are fourteen claims in their group.

W. Hurst and P. S. Martin have opened a deposit of fireclay on their group of claims near Shauntie. It will be tested at the smelter.

CARBON COUNTY.

Superintendent O. H. Bossert of the Raven M. Co., near Price, has sixty men at work (forty being miners), and is shipping 175 tons a month of elaterite, extensively used in the manufacture of electrical insulating apparatus, and also being experimented with as a substitute for hard rubber.

GRAND COUNTY.

W. R. Wheat, superintendent the Grouse Mountain M. Co., near Basin, has begun operations.

The Tornado M. Co., recently organized in Salt Lake, Manager W. S. Larsen, will begin operations on the Tornado at Basin March 1st. The Tornado is on Gold hill, east of the Iowa. A mill will be built. The Iowa tunnel is in 130 feet, with a few feet more to go to cut the vein in the Gold hill contact. A tunnel is being started on the Gold Hill group, adjoining the Iowa on the west, by W. J. Gardner & Co., of Cripple Creek, Colo., owning four claims in the south gold belt.

JUAB COUNTY.

The Dugway M. Co. has been incorporated, A. M., J. M. and E. M. Cannon, M. C. Chamberlain, G. J. Taylor, L. M. Cannon directors. The company has a group of claims in Dugway mining district in the Deep Creek, near Fish Springs.

The Victor and Boss Tweed companies in the Tintic district, near Eureka, will consolidate as the Victor Con. M. Co. Work has resumed through the Victor shaft, with J. Treloar as superintendent. G. Adams, president and manager of the Northwest M. Co., near Eureka, has arranged for a consolidation of the interests of his company with the Dagmar. The working shaft has been sunk 175 feet on the ledge. The company has a hoist with a capacity for sinking to 1000 feet.

Manager Joseph of the Carls M. Co., at Tintic, says lessees have uncovered 6 feet of ore, showing 10% copper, \$2 gold and forty ounces silver per ton. The find is in the Spy and in a faulted channel, which was recovered after driving 30 feet through a stratum of limestone. The company has started a drift to cut the same channel 100 feet below the lessees.

SALT LAKE COUNTY.

The Utah Con. smelter at Bingham forwarded 481,200 pounds of bullion to the East for the week ending Jan. 31. The smelter of the United States M. Co. sent 241,201 pounds, three furnaces being operated. The Bingham Con. did not forward any bullion, although the plant continued to treat 500 tons of rock daily.

J. S. Grow says at the Glenwood Co.'s mine in Polson's canyon, on the north side of Little Cottonwood, near Bingham, the tunnel is in 85 feet on the vein, which is 4 feet between walls. At this point a shoot has been found on the hanging wall which shows 15% copper, nine ounces silver and \$2 gold per ton.

The Mascot tunnel being driven into the Dalton & Lark group at Bingham has passed the 5300-foot station, and next month will tap the Brooklyn ledge at 6000 feet from the portal. From this station they will drift on the Brooklyn. The tunnel will continue across the country to the Lark vein, which will be cut at 7000 feet, and then to the Lead mine ledge at 7600 feet from the mouth of the tunnel.

SUMMIT COUNTY.

Assistant Manager E. Bamberger, of the Daly-West at Park City, says the damage to the Quincy shaft by the recent snowslide is not so great as was at first expected. It will cost \$2000 to put the shaft-house again in repair. The greatest damage will be in shutting off part of the supply of high-grade ore for a time. The output of the Daly-West for January was 8000 tons, valued at \$35 per ton.

Manager Lawrence says the main incline on the Scottish Chief mine, near Park City, has broken into the main ore body.

Manager H. C. Brownlee of the St. Louis-Ontario of Park City says he will put in a hoist to further develop their lower levels.

L. A. Jeffs, superintendent the Wolverine mine, near Park City, says the main tunnel is in 1220 feet with crosscutting. Drifting is in progress, and 427 feet were made last month with two machines.

WASHINGTON COUNTY.

Manager G. Snyder, the Utah & Eastern M. Co., near St. George, has thirty men at work, and the smelter will be blown in on February 25th. An ore body carrying 15% copper has been opened in the shaft and another in a crosscut.

WASHINGTON.

FERRY COUNTY.

J. King of Keller says of the mines at that camp: The Gold Chord, on the east side of the San Poll river, has twelve men at work crosscutting the 325 and the 150-foot levels, and blocking out ore for shipping and for the concentrator which will be put up by the company in the spring. Adjoining the Gold Chord on the west are the Caledonia and the Yellow Jacket. On the Summit the Summit M. & M. Co. has resumed sinking and have begun drifts and crosscuts at the 100 foot level. The shaft follows a ledge 4 feet in width between a schist, hanging and quartzite foot wall. The ore assays \$15 in gold, silver and copper. South of the Summit, at the Silver Hill lode of the Silver Hill M. & M. Co., they are down 80 feet and drifting. On the Malachite, of a group owned by the Lorraine M. & M. Co., a tunnel is being driven to tap the vein at a depth of 260 feet. On the west side of the San Poll, at the Manila, the owners are crosscutting at a depth of 240 feet. The owners of the Iconoclast have bought adjoining property and are putting up buildings.

The California mine, near Republic, shipped three carloads of ore last week to the smelter at Nelson, B. C. Twenty men are employed in the mine and the shaft is being retimbered preparatory to sinking below the 500-foot level. Superintendent Delbridge says a larger hoist, an air compressor and power drills will be put in.

C. Thels has been given an option on the Lone Pine-Surprise mine, in San Poll gulch, north of Republic, for \$150,000. Thels will put in machinery and develop the property.

OKANOGAN COUNTY.

The prospect of railroad transportation by the extension of the Great Northern branch from Curlew through Bolster and to the Okanogan has caused a renewal of mining operations around Bolster. The Lookout property, 1/2 mile southwest of Bolster, under bond to Tacoma men, is being worked by two shifts. Smelting ore is being opened up and assays show values in gold. H. Baldwin, who has a bond on the Grant claims, is working two shifts exploiting that copper property. The Blaine group is being worked by two shifts, says Manager Blaine. Manager Smalley of the Oregon has let a contract for sinking 40 feet deeper in the main shaft.

Work is resumed on the Security group of claims, on the west slope of Palmer mountain, near Loomis, and the tunnel is being driven ahead.

SKAMANIA COUNTY.

The Dixie Queen M. Co. have bought sixteen mining claims in the St. Helena district, near Stevenson. Four of the claims are in the Mountain King group, on which are 75 feet of tunnel, showing a vein 20 feet wide carrying copper sulphides, with small values in gold and silver. Seven of the claims are in the Star King copper group and three in the Star Queen group, on a vein of galena running 20% in lead, with silver values.

WHATCOM COUNTY.

(Special Correspondence).—The Henrietta group is an extension of the Great Excelsior. Nature has done the development work. The ledges, exposed by the cutting through of Wells creek and the Nooksack river, stand several hundred feet above the ground and from 50 to 300 feet wide. Men have been working on the Henrietta preparatory to the erection of a mill. Many assays have shown \$9 50, \$12 and \$16. The Bellingham Bay & British Columbia Railroad will run close to this mine. An extension of the railroad will be completed and running to within 6 miles of this mine about March 1, 1903. Rails are being laid. A further extension will be made over the divide into the Slate creek country. Seattle, Feb. 10.

WYOMING.

ALBANY COUNTY.

The Strong Copper Co. has bought the Strong-Laura group of lode claims in Horse Creek district, northeast of Laramie, for \$1,000,000.

BIG HORN COUNTY.

On Wood river, at Kirwin, near Meeteetse, the Wyoming M. & M. Co., with C. L. Tewksburg manager, have the shaft down 150 feet and showing up a lead of copper ore.

CROOK COUNTY.

The Wyoming-Black Hills R. R. Co.,

recently organ'ed by Twin City men, to develop the coal lands of north-eastern Wyoming, have let a contract for driving a tunnel at the coal mines, west of Sundance.

LARAMIE COUNTY.

It is reported that Omaha men will build a 300-ton smelter on the Platte at Guernsey, says C. A. Guernsey, who is interested in the iron mines in the Sunrise district near there. The Omaha Co. is the owner of the Green Hope copper mine. There are deposits of lime, iron and other minerals used by a smelter near, while coal can be had at Glenrock and coke at New Castle.

FOREIGN.

BRITISH COLUMBIA.

Shipments from Rossland camp for week ending February 7, and for year to date, are as follows:

	Week.	Year.
Le Roi.....	4,369	20,026
Centre Star.....	1,620	8,900
War Eagle.....	990	5,615
Giant.....	50	270
Velvet.....	160	916
Kootenay.....		225
Le Roi No 2.....	260	1,204
Homestake.....		90
Totals.....	7,389	37,246

It is reported G. H. Collins has the Charming claim (Golden Fleece), in the southwestern part of Deadwood camp, under option for \$10,000.

The following figures of output of British Columbia for 1902 are from an official source:

Placer gold.....	\$1,000,000
Lode gold.....	4,600,000
Silver.....	4,600,000 oz.
Copper.....	30,000, 00 lbs.
Lead.....	26,000,000 "
Coal—Crow's Nest.....	441,000 tons.
*Coke—Crow's Nest.....	112,000 "
Coal—Vancouver Island.....	1,290,315 "
*Coke—Vancouver Island.....	15,800 "

*Included in the coal mined.

In upper Pine creek, near Atlin, Loup, Green & Co. are working in ground yielding \$1 to the pan, drifting from a shaft 75 feet back from the creek, and have run in 90 feet. B. Davis & Co., below Loup & Co., are drifting up stream from a shaft 23 feet deep.

The Con. Spruce Creek Placers, Ltd., intend placing a plant on their claims near Atlin this season, says Superintendent Hirschfeld.

J. Lieberman of the Rocky Mountain D. Co., west of the Blood reserve, near New Denver, says they have completed one well, tapping oil at 1020 feet deep. Other wells will be drilled.

Since Porter Bros. began their contract with the Granby mines at Phoenix last summer, stripping from the surface of the Knob Hill and Old Ironsides claims, they have removed 15,000 cubic yards of material. The ore body is exposed for 750x250 feet, not counting the space still in process of stripping on the upper part of the hill.

A strike of copper and silver ore has been made at the Silver King mine, on Toad mountain, near Nelson, by M. S. Davys, lessee. The property is owned by the Hall Mines, Ltd.

The third payment on the Eva mine, Lardeau district, has been made by the Calumet and B. C. G. M., Ltd., amounting to \$10,000, a total to date of \$16,000.

The main shaft on the Iron Horse, Sloan district, is down 300 feet. The closing of the Enterprise has deprived them of power for drills.

The Le Roi No. 2 Co. at Rossland will install an experimental concentration plant and the first tests will be on the low-grade ores of the Josie and No. 1 mines.

The Onward claim, on Kethley creek, near Ashcroft, worked by Velth & Bolland, is producing pay gravel.

C. Chapman has men working deep placer ground on Flindley creek, near Fort Steele. A steam dredger is being put in on Perry creek by the Kootenay-Perry Creek M. Co. H. W. Ross will begin work on the Roaring King gold mine, on Perry creek.

The manager of the Union Jack mine at Ymir says a payshoot of galena has been cut at 165 feet in on the lower tunnel, the ore averaging \$32 a ton. Previous to this strike the vein faulted.

The official returns for 1902 of the Lardeau mining district show: Free miners' certificates, 273; mineral claims recorded, 198; certificates of work, 557, and certificates of improvement, 9.

Superintendent J. L. Parker is sinking the shaft at the North Star mine, near Fort Steele. The St. Eugene mine and concentrator are in operation. The Sullivan mine will resume next month. H. W. Ross is developing the Silver Queen mine on Lost creek, 8 miles from Fort Steele.

MEXICO.

CHIHUAHUA.

The mill of the Adela mine at Santa Barbara is finished, but will not be in operation till March 1, as the aerial tramway of a mile in length is being built, says W. Pett, manager and part owner.

The first payment of \$38,000 gold has been made on the Perros Bravos group of mines, near Parral, by Pittsburg men.

F. McDonald & Co. are working a number of mining properties in Terrazas camp and the Santa Alicia in Victoria camp, 6 miles west of Terrazas. This mine consists of twenty-two pertenencias, from which the ore runs fifty ounces silver.

Dale Bros. & McDonald are working the Guadalupe lead mine at Terrazas. The vein is in porphyry and deposits are found in the horizontal planes. At 65 feet a plane was struck showing ore running 100 ounces silver, 35% lead and some gold.

At Maguarichic, southwest of Miñaca, the Sunset M. Co. will install a lixiviation plant of sixty tons daily capacity.

The Matulana mine at Ocampo, is sold to D. Minahan, of the Belen M. Co., for \$10,000.

Manager N. Lease, of the San Ramon Gold, Ltd., at Ocampo, says operations will be resumed on the San Ramon mine.

DURANGO.

The Mexican National Iron and Steel Co. is building a 100-ton blast furnace and two fire-brick stoves at its plant, a mile north of Durango, at the foot of Iron mountain.

GUANAJUATO.

The Minas de la Casa Real, near Guanajuato, have been sold for \$1,000,000 Mexican money. The sale includes the houses and reduction works in the city of Guanajuato.

SONORA.

(Special Correspondence).—The Creston-Colorado Co. is reported to have disposed of its interests, the control passing Jan. 1, 1903. G. J. McCarty is retained as general manager and J. G. Hardy is assistant general manager.

The 10-inch hole being sunk by the Grand Central Co. near their side line to catch the new ledge in the Creston on its dip is down 800 feet. Work on it is stopped for the present—cause unknown. The Grand Central mine and mill have been shut down for months and the mine dismantled of rails, pumps, etc.

La Colorado, Feb. 8.

A gold strike is reported south of Douglas, Ariz., in the Terres mountains, 40 miles from Cos, terminus of the Nacozari railroad. E. M. Sturges & Co. claim to have taken out several thousand dollars in gold in the last six weeks.

SOUTH AFRICA.

TRANSVAAL.

The mine owners have labor agents in Europe and arrangements are reported made for 6000 Italian laborers. It is also reported that a large number of laborers will be secured in southern Russia.

The total gold output of companies making returns to the Rhodesian Chamber of Mines at Bulawayo for the month of December amounted to 16,210 ounces, an increase of 287 ounces as compared with the previous month, and an increase of 1036 ounces over the corresponding period of 1901. The monthly returns for 1902 have been as follows:

	Ounces.
January.....	15,955
February.....	13,204
March.....	16,891
April.....	17,559
May.....	19,698
June.....	15,842
July.....	15,226
August.....	17,747
September.....	15,164
October.....	16,849
November.....	15,923
December.....	16,210

Total.....194,268

The Chamber of Mines has decided to raise the rate of wages paid to Kaffirs to the scale in force before the war.

Obituary.

CARL BINDER died in Chicago, Ill., on the 4th inst., aged 50 years. He came from Germany in 1884 and attained prominence as a constructing engineer. A widow and two daughters survive him.

F. A. HAYES, superintendent of the Big Five tunnel at Howardsville, San Juan county, Colo., was caught in a snowslide, February 2, while coming from the tunnel and killed. Deceased was 37 years old and leaves a wife and four children.

PERSONAL.

F. C. ROBBINS, E. M., is now located in Los Angeles, Cal.

S. NEWHOUSE of Salt Lake City, Utah, has gone to Europe.

J. C. ROBERTS is superintendent Peabody mine, Grass Valley, Cal.

ED. S. CAMPBELL has returned to Prescott, Ariz., from Chicago.

O. H. BOSSERT is superintendent of the Raven M. Co., near Price, Utah.

J. B. FARISH, a mining engineer of Denver, Colo., is in San Francisco, Cal.

G. M. HAYS president of the Balhinch M. Co., near Eureka, Utah, is in Denver, Colo.

G. S. ANDUS of Globe, Ariz., is consulting engineer of the Gila-Pinal Co., near Globe.

G. MITCHELL, general manager of the Cananea Con. M. Co., is at Cananea, Mexico.

N. LEASE is manager of the San Ramon Gold, Ltd., at Ocampo, Chihuahua, Mexico.

J. W. DOUTY is mine superintendent of the Jupiter M. Co., near Deadwood, South Dakota.

W. H. HANNON of the Indiana-Tonopah mine, at Tonopah, Nev., is in San Francisco, Cal.

C. T. GADSEN, superintendent New Mines Syndicate, Yogo, Mont., has gone to London, Eng.

ALGERNON DEL MAR has gone from Pasadena, Cal., to Pine Grove, Esmeralda county, Nevada.

W. SMITH is assistant superintendent of the Kennedy mine, near Jackson, Amador Co., Cal.

C. T. ROUNER, chief engineer the Electric mine, near Grass Valley, Cal., is in San Francisco, Cal.

W. G. SCOTT, superintendent of the Black Oak mine, Soulsbyville, Cal., is in San Francisco, Cal.

G. W. TYNAN of Independence, Colo., is superintendent of the Hanover mine, Cripple Creek, Colo.

J. GREEN, of Park City, Utah, formerly of the Naylor mine in Utah, is in San Francisco, Cal.

R. D. HUNTER, Western agent Sullivan Machinery Co., has returned from South Africa to Denver, Colo.

C. A. HOLLAND is superintendent of the Altadena mine, near Columbia, Cal., vice J. Filmore, resigned.

J. H. HAMMOND is consulting engineer of the Tonopah M. Co. of Philadelphia, with mines at Butler, Nev.

MANAGER W. C. WYNCOOP of the Liberty mines at Butler, Nev., returned last week from Philadelphia, Pa.

S. LEVY, superintendent the Sampson mine of Bingham, Utah, is in Nevada examining mining properties.

A. I. GOODELL, superintendent of the Sunset smelter near Phoenix, B. C., is in Montreal on company business.

PRESIDENT E. L. WHITE of the Bingham Con. M. Co., Bingham, Utah, has gone to New York on a business trip.

J. FAWCETT, part owner of the Psyche mine, near Sumpter, Or., has returned to Omaha, Neb., from a visit to the mine.

W. J. MCGOFFIN, of Lead, S. Dak., president the United Ruby G. M. & M. Co., is in the East on company business.

J. B. GIRAUD of Prescott, Ariz., is chief engineer of the United Gold & Platinum Co. at Supai, Coconino county, Ariz.

H. H. HELM of Prescott, Ariz., has accepted a position with the Guggenheim Exploration Co. at Santa Barbara, Mexico.

F. D. ADAMS has resigned as superintendent of the Gila-Pinal M. Co., near Globe, Ariz., and has gone to Oakland, Cal.

G. W. LAMOS is putting in machinery for the Mine & Smelter Supply Co. of Denver, Colo., at Grand Encampment, Wyo.

SUPERINTENDENT W. W. WARREN of the Butte-Tonopah mine, near Butler, Nev., is in San Francisco, Cal., on business.

GEO. H. STRONG of the patent firm of Dewey, Strong & Co., has returned to San Francisco, Cal., from Honolulu, Hawaii, U. S. A.

J. DOYLE, manager of the Giant Tonopah M. Co., returned last week to Butler, Nev., from a business trip to San Francisco, Cal.

F. G. STEVENS, a mining engineer of Rossland, B. C., has returned from a two months' visit to Halifax and other Eastern points.

CARL ANDERSON will act as consulting and managing engineer for the Nevada Keystone M. Co., Yellow Pine, Lincoln county, Nevada.

CHAS. F. HENDRIE, treasurer The Hendrie & Bolthoff Mfg. & Supply Co., has returned to Denver, Colo., from an extended European trip.

F. O. CHAMBERLAIN of Bakersfield, Cal., vice-president of the Butte-Tonopah M. Co., near Butler, Nev., will take up his permanent residence at Butler.

E. HAWLEY of New York has been elected a member of the executive committee of the Greene Con. Copper Co., of Cananea, Mex., vice A. Romer, resigned.

L. HARRIS, formerly manager of the Revenue mine, in Montana, is manager of the Sunshine M. Co.'s mines and mill at Sunshine, Utah, vice G. Moore, resigned.

GODFREY DOVETON, metallurgist of the Camp Bird mills, Ouray, Colo., will establish an office in Denver, Colo., about the 20th inst., resigning from the Camp Bird.

G. MOORE has resigned as manager of the Sunshine M. Co.'s mines and mill at Sunshine, Utah, and gone to Milford, Utah, to examine a group of copper properties.

S. F. PARRISH, formerly manager of British Columbia mine, in Summit camp, near Greenwood, B. C., has gone to Rossland, B. C., to take the position of manager of the Le Roi mine at Rossland and the Le Roi Co.'s smelter at Northport, Wash.

Commercial Paragraphs.

J. H. GIBSON has opened offices at 944 Monadnock building, Chicago, Ill., furnishing mine and smelter supplies.

NORMAN A. ROOT, formerly with Henshaw, Bulkley & Co., is now established as an engineer and machinery commission merchant at Room 403, 519 Mission St., San Francisco, Cal.

THE C. O. Bartlett & Snow Co., Cleveland, Ohio, write that they are in receipt of a large order for fertilizing machinery from the West Rand Fertilizer Co., Krugersdorp, Transvaal, South Africa.

THE Stilwell-Bierce & Smith-Valle Co., Dayton, O., write that Geo. W. Ingalls has been appointed direct representative of that company with offices at 11-13 First street, San Francisco, Cal. Associated with Mr. Ingalls, and in charge of the water wheel department, E. G. Dewald will be permanently connected with this office. The company state that they will be prepared to make estimates on water wheel units from 10 to 16,000 H. P. from 6 to 2000 feet head.

THE J. H. Montgomery Machinery Co. of Denver, Colo., report having sold during the past week to the Rex Cobra Mining Co. of Chloride, Ariz., the Keystone Bank of Keystone, S. D., H. S. Merrill of Gold Hill, Colo., and the Golden Banner M. & M. Co. of Custer, S. D., one each of their Common Sense steel whips, with hoisting rope, buckets, cars, etc., and that they also outfitted the Colorado Springs Pressed & Fire Brick Co. with belts, shafting, etc. They report the prospects for next season bright and that they are making figures for several large cyanide and concentrating mills.

MANY of the largest cement manufacturers of the country, appreciating that the Griffin mill gives satisfaction as a cement grinder, are buying large numbers of these mills. Among the new orders booked by the Bradley Pulverizer Co. during the month of January have been the following: Penn Allen Portland Cement Co., Allentown, Pa., entire grinding machinery for their new works; Lehigh Portland Cement Co., grinding machinery for 2000-barrel plant to be erected at Ormrod, Pa.; Quaker Portland Cement Co., grinding machinery for their 4000-barrel plant to be erected at Stockertown, Pa.; also additional mills for the Lehigh Portland Cement Co. at their mill D in Mitchell, Ind., mill A, Ormrod, Pa., mill B, West Copley, Pa.; additional grinding machinery for the Iroquois Portland Cement Co., Caledonia, N. Y., and also for the Wolverine Portland Cement Co., Coldwater, Mich., and the Bronson Portland Cement Co., Bronson, Mich.

Books Received.

Bulletin No. 7, being a general review of mining in British Columbia, has been received. It contains much valuable information regarding the mines of that province. Bulletin No. 9 of the same department treats of the undeveloped regions of the province.

"The Diamond Mines of South Africa," by Gardner F. Williams, is the title of a handsome volume (edition de luxe) containing 681 pages, with several hundred illustrations, many of them of superb design and execution. The book deals with the subject in every phase from which it can be viewed: Historical, technical, practical and scientific. It describes in detail the interesting geological occurrence of the diamonds of South Africa, the means formerly employed to recover them, and the present practice as developed under the direction of the author himself. The mining, milling and washing processes are fully described. The chapters devoted to modern mining methods as applied to these mines are very interesting and instructive. The surface plants, steel head-frames and works are also given the space their importance deserves. Cutting and polishing the diamond is described in all its interesting detail and considerable space is devoted to the social and political life of South Africa. Not the least interesting portion of the book is the description of the late war in South Africa, and its effect on the diamond mining industry. The volume will take its place in the classics of mining literature. Price, \$10; The Macmillan Co., New York and London.

Catalogues Received.

The fourth edition of the Farrell Ore and Rock Crushing Machinery Catalogue, from Earle C. Bacon, Havemeyer building, New York, is replete with illustrated information of the various styles and sizes of such machinery made by that company. It is finely produced and, besides other data, gives many handsome views of large crushing and milling plants.

Catalogue No. 75 from the Jeffrey Manufacturing Co., Columbus, Ohio, is devoted mainly to the Barney Brick Conveyor system, profusely illustrating and describing its manner of operation. The Century belt conveyors, bucket elevators, chains, screens, mixers, water elevators, horse powers, electric storage battery locomotives, excavators, loaders and other labor-saving appliances made by the Jeffrey Manufacturing Co. are also illustrated in their handsome treatise.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

DOUGH CUTTING AND WEIGHING MACHINE.—No. 719,923. Feb. 3, 1903. H. P. West, San Francisco, Cal. This invention relates particularly to that class of machines which are designed for the weighing of plastic materials, such as dough, and the object is to provide a continuously operating machine into which a mass of dough may be fed and which machine will automatically separate the desired quantity from the mass and weigh and deliver the same.

STACKING LUMBER.—No. 719,663. Feb. 3, 1903. F. M. Hazleton, Sierraville, Cal. This invention relates to improvements in stacking lumber, and is especially designed for the care of the "sit kers," so-called, which separate the lumber, and the protecting roof boards. It consists of a series of posts set between each of the lumber stacks and having transverse bars or sections attached at intervals between the top and bottom for the purpose of holding the stacks. These posts also have caps at the top which receive joists across the two ends of the stack, and these joists serve to carry a roof or covering to protect the lumber from sun and weather. The object of this is to provide a means for preserving the roof boards and stickers and holding the latter in place for convenient use.

OIL BURNERS AND FEED MECHANISM THEREFOR.—No. 719,716. Feb. 3, 1903. John W. Anderson, San Francisco, Cal. This invention relates to improvements in hydrocarbon burners for use in boiler furnaces and the like, in which steam and oil or kerosene are coming fed to form the inflammable vapor. Its main object is to provide a burner of simple construction suitable for low grade oils, and which will give an equable distribution of heat in the fire-box without the use of baffle walls. Another object is to effect improvements in the manner of attaching the burner to the furnace door, and in means of connecting the burner with the source of fuel supply, whereby the burner may be withdrawn from the furnace simultaneously with the opening of the door.

BAKE OVEN.—No. 719,551. Feb. 3, 1903. C. P. Dowd and J. H. Coleman, San Francisco, Cal. This invention relates to improvements in bakers' ovens of the type commonly known as "cracker ovens," in which the heated products of combustion are discharged directly into the oven chamber and in

which chamber is a revoluble reel or wheel with pendant trays carrying the articles to be baked. The object of the invention is to adapt these ovens to the use of oil fuel and to secure better means of heat distribution and control than has heretofore been possible. The object is effected by a certain arrangement of flues and dampers, and by using crude oil as fuel we can at all times regulate the fuel feed to the amount of heat necessary in the oven chamber and can distribute the heat therein according to the nature of the articles to be baked.

SKIRT SUPPORTER.—No. 719,555. Feb. 3, 1903. J. H. Griswold, Oakland, Cal. The object of this invention is to provide a simple, artistic, economically constructed holder which can be quickly engaged with or disengaged from the skirt, and which will not tear or otherwise injure the finest fabric. It consists of a skirt holder comprising a tubular handle, a wire passing the end thereof, in which members the folds of a dress are adapted to be engaged, the ends of said wire encased within the handle and having a sliding movement therein whereby said clasp members may have a limited movement to and from each other.

APPARATUS FOR MAKING HOLLOW ARTIFICIAL STONE BLOCKS.—No. 719,555. Feb. 3, 1903. Secondo Ciletti, San Francisco, Cal. This invention relates to improvements in devices for forming hollow blocks, tiles and the like used in building construction. Its object is to provide a mold with a contractible core, which can be readily withdrawn after the block has been cast about it. The invention comprises the combination, with a suitable mold, of a core having its walls pivotally connected by radially disposed links, with a lever extending centrally through the core whereby the walls of the core may be expanded or contracted, according as the links are operated in the act of inserting the core into the mold or withdrawing it therefrom.

OIL BURNER.—No. 719,555. Feb. 3, 1903. J. J. McDonald, of Berkeley, and A. D. McLean, of San Francisco, Cal. This invention has for its object to provide a burner for low-gravity oil and suitable for use, particularly with marine boilers. It consists essentially in the combination of a casing or shell, an oil pipe extending centrally through the casing, a jetting beyond the front end of the casing, an annular steam chamber formed between the casing and said pipe, an annular beveled-edge partition adjustable on said pipe and adapted to form an annular steam passage with the end of the casing, a cap or second casing member supported on the extension of the oil pipe, an annular oil chamber formed between said cap and pipe, and an oil outlet between the adjacent edges of the cap and partitions.

PORTABLE FOOT AND BODY WARMER.—No. 719,638. Feb. 3, 1903. F. Battier, Tillamook, Or. This invention relates to a device which is designed to be carried or worn by individuals under conditions where the natural heat of the blood is not sufficient or in which there is intense exterior cold against which the person should be guarded. It consists in the combination in a portable heating apparatus of a case secured to the person, a heater contained within the case, a plurality of pads applied to the extremities, cuffs or pipes connecting the heater with the pads, return pipes and receivers within the case into which said pads discharge, and through which the circulating medium is returned to the heater, and a valve located between the receiver and heater and mechanism, by which it is intermittently opened or closed.

WALL OR CHIMNEY CONSTRUCTION.—No. 719,679. Feb. 3, 1903. J. F. Lyman, San Francisco, Cal. This invention relates to improvements in the construction of walls, chimneys, and like structures. It consists in a means for building such structures, as concrete with one or more hollow tubular openings formed within the structure and extending from the bottom to the top. In the construction of chimneys having one or more flues, or of walls for buildings in which such passages are to be made, either to be used as chimneys or for the convenient laying of gas and water pipes, a electric and other conductors, wires, or for heat passages for furnaces, it is desirable to form such walls by building them up continuously of concrete and simultaneously forming the open passages from bottom to top. In order to build the walls and continuously extend these passages forms or molds are employed, between which the concrete is tamped and within the space between the walls are other forms, which are placed as to form the continuous openings between the walls.

New Patents.

DEWEY, STRONG & CO'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING FEBRUARY 3, 1903.

719,716.—OIL BURNER—J. W. Anderson, S. F.
719,632.—RAILWAY SIGNAL—C. P. Bass, Portland, Or.
719,638.—FOOT AND BODY WARMER—F. Battier-Tillamook, Or.
719,563.—PURGLAR ALARM—I. S. Bunker, Free water, Or.
719,738.—LOADING FISH TRAP—A. C. Burdick, Seattle, Wash.
719,746.—FLUID CLUTCH—B. B. Chandler, Jr., Nevada City, Cal.
719,751.—SPIRAL ELEVATOR—D. E. Condon, S. F.
719,567.—EXCAVATOR—J. J. Conlin, S. F.
719,651.—BAKE OVEN—Dowd & Coleman, S. F.
719,652.—SMOKE FLUE—D. Elstein, S. F.
719,655.—HOLLOW STONE BLOCKS—S. Giletti, S. F.
719,582.—COLD SEPARATOR—J. H. Gray, S. F.
719,656.—SKIRT SUPPORTER—J. H. Griswold, Oakland, Cal.
719,663.—STACKING LUMBER—F. M. Hazleton, Sierraville, Cal.
719,810.—FRUIT RECEPTACLE—J. J. Jones, Los Angeles, Cal.
719,675.—MASSAGE MACHINE—F. King, S. F.
719,477.—TRAMWAY CARRIAGE—F. H. Lamb, Hoquiam, Wash.
719,478.—CAHLEWAY—F. H. Lamb, Hoquiam, Wash.
719,679.—WALL CONSTRUCTION—J. F. Lyman, San Francisco, Cal.
719,688.—OIL BURNER—McDonald & McLean, S. F.
719,488.—PROCESS—Geo. Mitchell, Naco, Ariz.
719,905.—SEEDER—J. Thooljian, Del Rey, Cal.
719,923.—DOUGH MANIPULATOR—H. P. P. West, S. F.
719,930.—SALES BOOK—H. H. Winslow, Portland, Or.

Latest Market Reports.

SAN FRANCISCO, Feb. 13, 1903.

METALS.

SILVER.—Per oz., Troy: London, 21s 15d (standard ounce, 925 fine); New York, bar silver, 47½¢, refined (1000 fine); San Francisco, 47½¢; Mexican dollars, 38 @39¢ San Francisco, 37½¢ New York.

The above quotations show a small raise in price over a week ago, but are of no particular importance.

COPPER.—New York: Standard, \$12.50; Lake, 1 to 3 casks, \$12.75; carload lots, \$12.00; Electrolytic, 1 to 3 casks, \$12.85; carload lots, \$12.50; Casting, 1 to 3 casks, \$12.75; carload lots, \$12.50. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24¢. London: 257 5s spot per ton.

The enormous consumption of copper in 1902 is indisputable, and it is recognized that the demands for 1903 cannot be other than great. This fact alone might furnish a specific explanation for a large measure of the sanguine tone regarding the future of the market, although other potent forces are tending in the direction of securing more normal conditions. Production is large and on the increase at some sources; but, notwithstanding all the growth in output during the past twenty years, the available free copper left over on January 1, 1903, amounted to a comparatively small percentage of the total production for the two decades ended with 1902. United States copper production from 1883 to 1902, inclusive, amounted in the aggregate to 7,215,944,524 pounds; and taking the very highest estimate of stocks existing at the beginning of this year, among all the published statistics, the quantity of copper available in this country was less than 4½% of the above-named production, including imports also during the period named.

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots, 4½¢ 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½¢; pig, \$4.75. London: £11 8s 9d per long ton = 2.47¢ per lb.

SPELTER.—New York, \$5.05; St. Louis, \$4.60; London, £20 7s 6d per ton; San Francisco, ton lots, 6½¢; 100-lb lots, 7¢.

ANTIMONY.—New York, Cookson's, 9½¢; Hallett's, 8½¢; San Francisco, 100-lb. lots, 10¢; 300 to 500 lbs., 11¢; 100-lb. lots, 13@15¢.

TIN.—New York, pig, \$29 30@29 35; San Francisco, ton lots, 31¢; 500 lbs., 31¢; 200 lbs., 31¢; less 3¢; bar tin, \$1.35 @37½¢. London, £132 7s 6d spot.

PLATINUM.—San Francisco, crude, \$18.00 per oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80¢ per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots, London, £8 15s; San Francisco, local, \$45.50 per flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10¢; No. 2, 7¢; No. 3, 6½¢; extra, 17½¢; genuine, 35¢; Eclipse, 37½¢.

ALUMINUM.—New York, No. 1, 99¢ pure ingots, 35¢; No. 2, 90¢, 30¢ to 34¢.

SOLDER.—Half-and-half, 100-lb. lots, 20¢; San Francisco, Plumbers', 100-lb. lots, 16 65¢.

NICKEL.—New York, 50@60¢ per lb.; ton lots, 45@48¢.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$21.85; gray forge, \$20.50; San Francisco, bar, 3¢ per lb., 3½¢ in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.00; San Francisco, bar, 7¢ to 12¢ per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....\$24.50@25.00
Foundry Northern 1.....23.50@24.00
Northern 2.....22.50@23.50
Northern 3.....22.00@23.00
Southern 1.....23.35@24.85
Southern 2.....22.85@24.35
Southern 3.....22.35@23.85
Forge.....21.85@23.35
Charcoal.....26.00@27.00
Billets, Bessemer.....33.00@34.00
Bars, iron.....1.75@1.85
Bars, steel.....1.75@1.80
Rails, standard.....28.00@30.00
Rails, light.....34.00@40.00
Plates, boiler.....1.90@2.00
Tank.....1.75@1.80
Sheets, 26 store.....2.90@3.00
No. 27.....3.00@3.10
No. 28.....3.10@3.20
Angles.....1.75@—
Beams.....1.75@—
Tees.....1.80@—
Zees.....1.75@—
Channels.....1.75@—
Steel melting scrap.....18.00@18.50
No. 1 railroad wrought.....18.50@19.00
No. 1 cast, net ton.....17.50@18.00

Iron rails.....24.00@25.00
Car wheels.....23.00@23.50
Cast borings.....10.25@10.50
Turnings.....14.00@14.50

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26¢ per lb.; carloads, 24@24½¢; in tins, 35¢; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 2½@3¢ per lb.; caustic soda, in drums, 3@4¢ per lb.; Cal. s. soda, bbls., \$1.25@1.50 per 100 lbs.; sks., \$1.05; chlorate of potash, 12@13¢; nitrate of potash, bbls., 8¢; caustic potash, 10¢ in 40 lb tins; borax concentrated, 7@8¢ per lb.; roll sulphur, 4@6¢; ground sulphur, 4@6¢; flour sulphur, French, 2@3¢; alum, \$2.00@2.25; California refined, 2@2½¢; sulphide of iron, 9¢ per lb.; copper sulphate, 5@7¢; chloride of lime, spot, \$3.00@4.00; sulphuric acid, in carboys, 66¢, B. 2¢ per lb.; nitric acid, in carboys, 8¢ per lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$28.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15¢; less than one ton, 17¢. No. 1*, 60%, carload lots, 13¢; less than one ton, 15¢. No. 1** 50%, carload lots, 11¢; less than one ton, 13¢. No. 2, 40%, carload lots, 10¢; less than one ton, 12¢. No. 2* 35%, carload lots, 9¢; less than one ton, 11¢. No. 2** 30% carload lots, 9¢; less than one ton, 11¢. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½¢ per set; 14 oz., 40s., 9½¢.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmore, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Linedseed, boiled, bbl., 56¢; cs., 61¢; raw, bbl., 54¢; cs., 59¢; Lucid oil, boiled, bbl., 50¢; cs., 55¢; raw, bbl., 48¢; cs., 53¢. Kerosene—Pearl, per gal., 22½¢; Astral, 22½¢; Star, 22½¢; Extra Star, 25½¢; Eocene, 24¢; Elaine, 27½¢; Water White, in bulk, 16¢; Mineral Seal, iron bbls., 18½¢; wooden bbls., 21¢; cs., 24¢; Mineral Spermin, cs., 26½¢; Deodorized Stove Gasoline, bulk, 17¢; do., cs., 23½¢; 86° Gasoline, bulk, 21¢; do., cs., 27½¢; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 16¢; do., in cs., 22½¢; do. Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75¢; cs., 80¢; cs., No. 1 bbl., 57¢@60¢; Spermin, crude, 50¢@60¢; Natural White, 65¢; Bleached do., 70¢; Whale Oil, cs., 50¢@55¢.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., per lb., 6½¢; in 25-lb. tin pails, 7¢ per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 7¢ per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¢; do. in kegs, 6½¢.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., 6½¢.

LITHARGE.—Pure, in 25-lb. bags, 8 @9¢ per lb.

BONE ASH.—Extra No. 1, 5@6¢ per lb. No. 1, 4@5¢.

BORAX.—Concentrated, 7@9¢ per lb.; powdered, 9@12¢; fused, 25@30¢.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4¢ per lb.

BORAX.—Crystal, 7¢; calcined, 25¢.

COPPER.—Sulphate, 5@7¢.

MANGANES.—(90% and over) per lb., \$1.25.

MOLYBDENUM.—250. 3 grammes; 1000 grammes—2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, per lb., \$1.25.

MERCURY.—Bichloride, per lb., 90¢.

PHOSPHORUS.—(American) per lb., \$1.00.

SILVER.—Chloride, per oz., 90¢@1.00; nitrate, 55¢.

URANIUM.—Oxide, per lb., \$3.50.

ZINC.—Metallic, chemically pure, per lb., 50¢; dust, per lb., 10¢; sulphate, per lb., 10¢. (These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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Types of Head Frames.

The designing and construction of head frames are always matters of interest to the miner and engineer. Often the situation has an important bearing upon the type of frame selected, though under more favorable economic conditions some other type of frame would have been chosen. This is particularly exemplified in Fig. 3, which illustrates the head frame built at the Moon-Ancor mine, Cripple Creek, Colo. The timber obtained from local sources is inferior in quality and cannot be obtained in long sticks. The cost of Oregon pine being high, owing to railroad transportation, it was determined to build a structure of the timber cut in the neighborhood, and the frame shows clearly what ingenuity in design and mechanical skill can accomplish under difficulties like those mentioned. All of the timbers employed are short and knotty, requiring much splicing and extra bracing, but the frame is sub-



Fig. 2.—Two Post Frame, Cripple Creek, Colo.



Fig. 3.—Head Frame Moon-Ancor Mine, Cripple Creek, Colo.

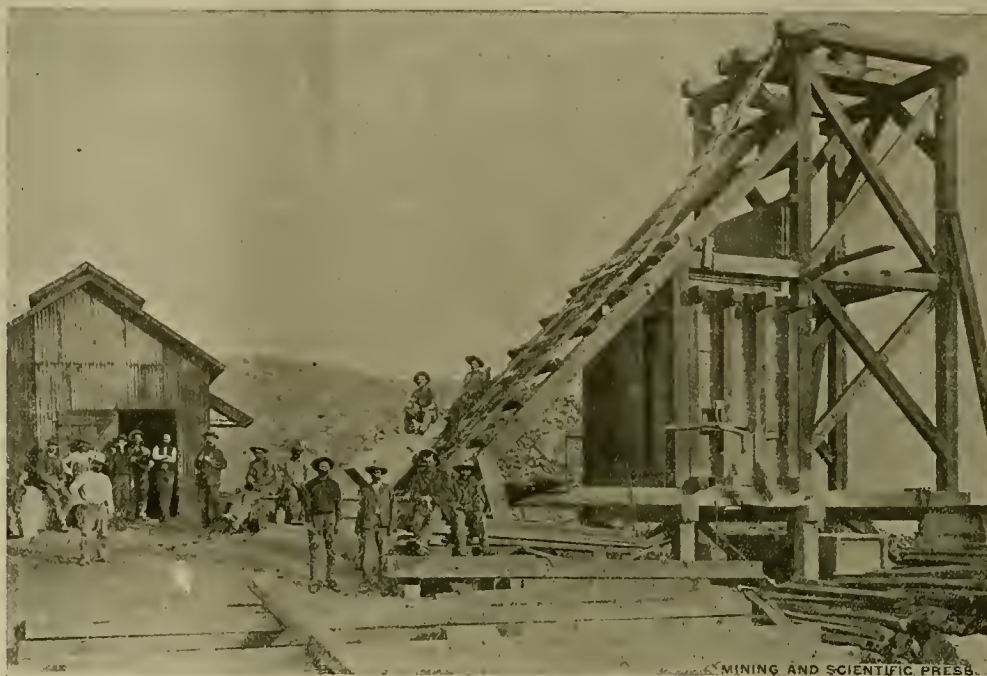


Fig. 1.—Head Frame Congress Mine, Arizona.

stantial and will answer every purpose. In the early history of Leadville millions of dollars worth of ore were hoisted from some of the richest mines in the district by employment of small hoisting plant and "tripod" frames—the simplest possible construction—but they answered the purpose at the shallow mines on Fryer hill. Fig. 4 illustrates a modern head gear in course of construction at the Wolfstone mine, on Carbonate hill, Leadville; and, though possibly from the standpoint of an engineer it does not represent the highest type of engineering skill, it has the merit of the smallest amount of material possible in a frame of its kind, in which respect it is in decided contrast with that at the Moon-Ancor mine of Cripple Creek. Fig. 2 represents a two-post frame at Cripple Creek. It is of simple construction and of a type in much favor in Montana and South Dakota, and more recently in California. A frame of this type can be employed at either a vertical or inclined shaft. Fig. 1 represents a third type of frame. Here, owing to lack of dump, the frame has been built upon a substructure of posts and caps. An unnecessary amount of material and labor has been wasted on this frame, which has little to recommend it beyond the fact that it is substantially built. It is at the Congress mine, Arizona.

Head frames should be constructed as cheaply as possible and of the best material available, but there is a great deal of difference in the design of frames, even in the same district. Some of the types most commonly seen have been adopted because they require less engineering and mechanical skill than others of a better and really simpler

type. In the four-post frames so often seen at least two of the main members of the frame are relatively useless, taking little or none of the resultant strains when hoisting is in progress. These two members are the two posts forming the front of the frame. The construction of the two-post frame fully illustrates this. Another important matter often overlooked is the necessity that the strain, the direction of which is between the upright posts and the hoisting reel, should fall inside the back braces.

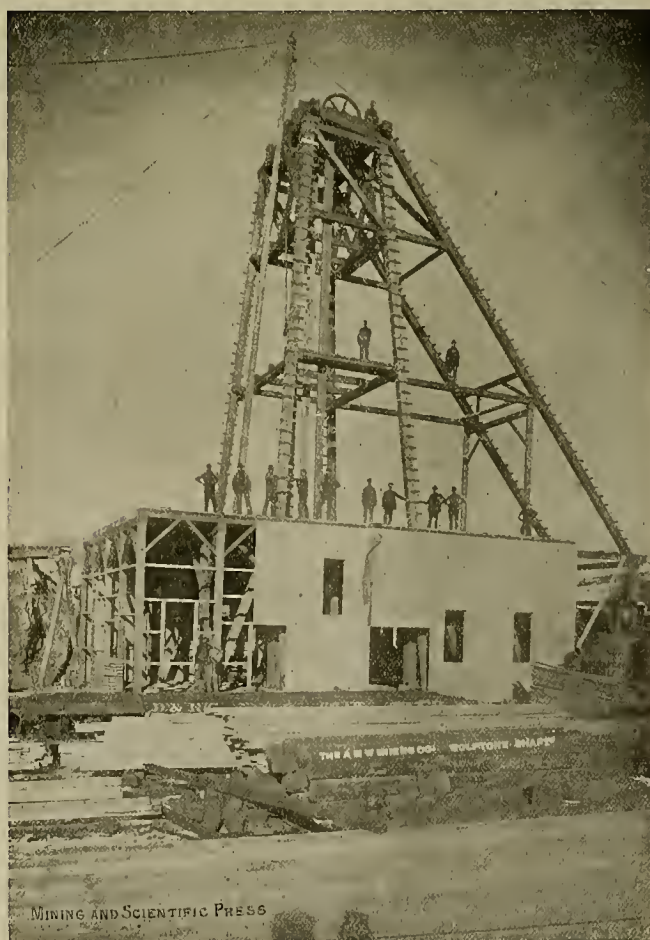


Fig. 4.—Four Post Frame, Wolfstone Mine, Leadville, Colo.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Head Frame Congress Mine, Arizona.....	113
Two Post Frame, Cripple Creek, Colo.....	113
Head Frame Moon-Anchor Mine, Cripple Creek, Colo.....	113
Four Post Frame, Wolfstone Mine, Leadville, Colo.....	113
The Development of High Pressure Centrifugal Pumps.....	117
An Automatic Tripping Device.....	118
Loss of Head Due to Friction of Steam in Pipes.....	119
A 110 H. P. Traction Engine.....	120
The Brownell Frue Vanner.....	120
Holst and Shops, Stonewall Mine, San Diego Co., Cal.....	121
Mining and Metallurgical Patents.....	121-122
EDITORIAL:	
Types of Head Frames.....	113
2222nd Issue of This Journal.....	114
Excessive Capitalization.....	114
The Valuation of Mines.....	114
Timber on Unsurveyed Lands.....	114
The Department of Commerce.....	114
State Mining Laws.....	114
Annexation of a Portion of Arizona to Utah.....	114
MINING SUMMARY.....	123-124-125-126-127
LATEST MARKET REPORTS.....	128
MISCELLANEOUS:	
Concentrates.....	115
The Law of Faults.....	116
Natural Hydraulic Cement.....	116
Iron Bearing Rocks of Ontario.....	116
Stamp Milling and Amalgamation of Free Gold Ores.....	116
The Development of High Pressure Centrifugal Pumps.....	117
Pyrites Deposits in Alameda Co., Cal.....	117
An "All-Fire" Method for the Assay of Gold and Silver in Blister Copper.....	118
Renewed Interest in Tin Mining.....	118
An Automatic Tripping Device.....	118
Separation of Zinc Ores.....	118
The Friction of Steam in Pipes.....	119
Winding Plants for Great Depths.....	119
The Brownell Frue Vanner.....	120
Large Traction Engine.....	120
The Stonewall Mine.....	121
The Mesh of Wire Screens.....	121
Unfavorable Conditions in the Arid Regions of the Southwest.....	121
Mining and Metallurgical Patents.....	121-122
Personal.....	122
Commercial Paragraphs.....	128
Catalogues Received.....	128
Books Received.....	128
New Patents.....	128
Notices of Recent Patents.....	128

THIS is the 2222nd issue of this journal. It looks different from the 1111th issue, and the 3333rd issue will, doubtless, look different from this one. It is interesting to note in the old files the history of mining and metallurgy through the years and the progress therein, an advance in which this journal has so prominent a part. A present thought in connection with the two thousand two hundred and twenty-second issue of this journal is the increase in the number of publications devoted to the allied industries that this journal has represented for nearly forty-three years. Time was when there was but one—the MINING AND SCIENTIFIC PRESS—in the whole country. Then one was established in New York City in 1866, another in Denver, Colo., in 1873, and now there are few mining centers west of the Missouri that have not a mining paper, sometimes two or more, a gratifying fact, showing what prominence the mining industry has assumed with the growth and development of the country; showing, too, that all this growth and development is consequent upon the nation's mineral wealth, and that if it were not for its mineral resources the west half of the United States would be a century behind what it is. Where none but the daring started and none but the strong survived the foundations of the great mining commonwealths were laid in the years when a few scattering stage coaches carried the MINING AND SCIENTIFIC PRESS to isolated mining camps. That is a vanished era replaced by the busy hum of mining industry that has reflex in the pages of the present issue.

EXCESSIVE capitalization of new mining enterprises is not nearly so deplorable as misstatements of fact concerning the extent and real value of ore bodies, and other conditions having a direct bearing on the value of the proposition.

The Valuation of Mines.

When a mining engineer is called upon to examine and report upon a mine he takes upon himself a responsibility which may be far-reaching in its consequences, for upon his report money is likely to be invested or withheld from investment. He should not only make a careful investigation of the resources and condition of the mine, but should state every fact in any way having a bearing upon the cost of operating the property. It is comparatively easy for an experienced engineer to sample a mine, and by this means arrive at the gross value of the various blocks of ore as exposed in the workings, having the estimate on the average value of samples and the amount of ore "in sight," and many reports containing this sort of information neglect to give the cost of operations.

In addition to gross values of ore in sight should be given the cost of extracting the available ore, and of converting it into bullion, but some engineers do not give these figures, though offering no reason for failing to supply them. It is true, in some isolated cases, arbitrary costs may be difficult to arrive at, but ordinarily this is not so, there being sufficient precedent upon which to have approximate estimates, in the cost of operating other properties in the neighborhood.

Undoubtedly some engineers hesitate to give figures of probable cost for fear that those who may subsequently have the management of the property may work on different lines from those suggested in the report, with a consequent difference in cost, which may or may not be complimentary to the engineer making the estimate, but if the report is based upon the actual conditions and costs obtaining at the time the report is made, the engineer need feel no hesitancy in expressing his own conclusions. Some noted records have been made by engineers, who, having rendered a report on mining property, including statement of cost, and being placed in charge of the property, have made the expense account correspond so closely to their previous estimate of cost as to cause much favorable comment on the part of the owners.

Viewed from another standpoint, the person employing the engineer may desire to have the cost of mining and reduction omitted, as without the costs the report makes a favorable showing, owing to the large amount of "ore in sight," but if the cost of mining this ore and reducing it accompany the report, the most favorable statement would prove the property incapable of producing a profit. A noted engineer reported on a gold property some years since, and in his report stated that there were four millions of dollars in sight. Another engineer was sent to verify the report, and did so, but added that it would require five millions to get it out. This case is directly in point, and shows the necessity of a careful engineer making a report so complete that whoever may have occasion to read it may comprehend the situation in all its details, and from a business standpoint be able to judge of the commercial value of the property for themselves.

Timber on Unsurveyed Lands.

Unusual activity in the land department at Washington, D. C., has resulted in the seizure of a large amount of cord wood and mine timbers at Republic, in Washington. This timber has been cut on the unsurveyed lands in the northern part of the Colville reservation. The mining companies did not cut the timber, but as the men who did the cutting are poor and unable to pay for the trespass, the government agents are calling upon the mining companies for a settlement. The same thing has occurred many times in the past elsewhere, and in each case the government has shown a disposition to make the assessment as light as possible, as the fact is recognized that the timber is absolutely essential to the operation of the mines. The usual practice has been to fix a nominal price on the timber cut, as determined by the stumpage, without assessing additional charges as penalties. There is said to be no timber available other than that on the unsurveyed land of the government, and should the authorities deal harshly with the mine owners it would probably result in a suspension of mining operations there. The timber lands of that section of the State cannot be taken up

under any of the laws regarding timber lands, owing to the probability of its proving to be mineral land. In view of the circumstances, a satisfactory adjustment of the difficulty may be anticipated.

The Department of Commerce.

The new Cabinet Department of Commerce has begun its work with Secretary Cortelyou, the latest addition to the President's Cabinet. This journal had hoped that when a new department was created it would have been a Department of Mines, and did some energetic work in that direction, but public opinion east of the Rockies had not crystallized sufficiently, and the necessary recognition of the importance of the nation's greatest basic industry is deferred. However, next to the creation of a Cabinet Department of Mines and Mining, the most favorable governmental act affecting the development of the country's mineral resources is the new Cabinet department that begins its work this week, as it directly aids in the advancement of American manufactures, and thus indirectly in the advancement of the country's developed mineral wealth. In this regard it is to be observed that Secretary Cortelyou, the ninth addition to the President's official assistants, will direct the greatest commercial interests on the globe. His department has jurisdiction over the internal commerce of the country. This aggregated two billion dollars in 1850; three and one-half billions in 1860; six and one-fourth billions in 1870; seven and three-fourths billions in 1880; twelve billions in 1890; eighteen billions in 1900, and this year exceeds twenty billions. That is, it has increased ten-fold in fifty-three years. During the same period the population of the United States increased from twenty-three millions to eighty-two millions. So that while the country's internal commerce has increased ten-fold, the population has not increased four-fold. This is largely due to facilities of transportation, the inventive genius of our people, the richness of the country, and the development of our mineral wealth. In this increase of commerce the miner is a foremost factor. And not only in the production of mineral wealth, but in its manufacture, the mining States show gratifying advance. Take the one State of Colorado, which in 1890 showed a total of manufactures of \$42,480,205, and in 1900 produced a total of manufactures of \$102,830,137. Similarly may be cited the State of California, which in 1890 manufactured to the extent of \$213,403,996, and in 1900, \$302,874,761. Other commonwealths show equal proportionate advance, illustrating that mining and manufacturing go together, and that the ancient and honorable order of miners and metallurgists ever foster and encourage manufactures and the creation of industrial wealth. Hence it is with pleasure miners everywhere note the creation of the new Cabinet department, and with confidence look forward to the day when there shall also be a Department of Mines and Mining.

THE usual amount of State mining laws is before the State Legislatures. In Colorado the principal measure is a proposed eight-hour law for underground workers, which stands good show of being enacted. In California the bill establishing a State mine inspector is probably destined to the same defeat it has had before. Idaho has an eight-hour measure and a bill taxing the net profit of mines, which will apparently become a law. Oregon is trying to get needful appropriation for a State mining bureau. In Montana a bill has been introduced looking to the abatement of the smoke nuisance. The only way in which this may be wholly accomplished is by closing the smelters, and it is to be hoped the bill may not become a law. In Utah a bill has passed the Senate making it a misdemeanor for any mine operator to store in the mine any high explosive more than sufficient to supply the mine for twenty-four hours.

REPRESENTATIVES of the Utah Legislature J. H. Johnson and D. H. Morris are in Phoenix, Arizona, for the purpose of conferring with the Arizona Legislature on annexing that portion of Arizona Territory north of the Grand canyon of the Colorado to the State of Utah. For topographical reasons, if no other, this might be of some benefit, as the territory north of the canyon is practically inaccessible from the south side.

CONCENTRATES.

THE appearance of tin reported in the slags of Leadville blast furnaces may possibly be traced to the tin scrap used as a flux.

THERE is no standard price on manganese ore. The demand locally usually has an important influence on cost. Ore containing but 30% is low grade. Sixty per cent ore in San Francisco, Cal., is worth about \$10 per ton. It is sometimes bought by smelters for flux.

A MILLSITE cannot be patented separately unless it has on it a mill or other works for the reduction of ores, but in such case the millsite must be claimed independent of any lode claim ownership. Proof of the non-mineral character of the land must also be furnished.

METALLURGICAL PROCESSES which work well on a small scale in the laboratory do not always work well on a commercial scale, and experimenters should proceed cautiously, increasing the quantities employed in experiment until there is no doubt of the application of the laboratory process to commercial practice.

WHERE a mining company owns several claims on one hill or emulsion, but these claims are separated by other claims intervening, the owner of a tunnel, the mouth of which is located on the side of the hill, cannot reach the higher claims by driving through the intervening claim in which he has no interest, although he would be greatly benefited by such privilege.

THOSE seeding questions to "Concentrates" which involve possibly conflicting claim boundaries, extralateral rights, or any controversy over claim lines or disputes, can make the case much more comprehensive if they will send with their questions a sketch showing the relative position of claims, outcrop, dip, etc. The answers can then be made more intelligible and there is less likelihood of misunderstanding.

THE occurrence of fine placer gold with fine gravel, and of coarse gold with coarse, heavy gravel, is due entirely to the sorting action of water, the finer gold being carried farther, together with the finer gravel, than that which is coarse and heavy. The working of placer streams proves this abundantly, the fine gold being carried much farther than the coarse. The size of all the material in streams decreases with increasing distance from its source.

MINIUM, a natural oxide of lead, is found in some of the mines of Leadville, Colo., recently in the oxidized zone of the mines of the Progressive Mining Co. The presence of minium in the ore deposits of Leadville was recognized in the early history of the district. It is a mineral of relatively rare occurrence and is more valuable for cabinet specimens than as a commercial ore. It is of vivid red color, sometimes mixed with the yellow oxide, and occurs pulverent or in crystalline scales.

THE pounding in an engine cylinder may be due to defective valve setting, but it may usually be ascribed to some other cause. If the machine is properly set and in line and well keyed it is not likely to pound. The frequent breaking of the pinion teeth is probably due to defective alignment. An engine cylinder a small fraction of an inch out of line with the crank disc will always give more or less trouble when long continued—that is, steady running, such as is usually done when unwatering a mine is necessary—and will heat the boxes under such conditions.

NEXT to quartz the most important rock-forming mineral is feldspar, particularly in eruptive rocks. The names of many igneous rocks is determined by the predominance of certain feldspars. The most important feldspar is orthoclase (potash feldspar), of which there are two kinds, orthoclase and sanidine. The former occurs in the Archæan and intrusive rocks and sanidine in the extrusives or those eruptive rocks which reach and overflow the surface, as trachyte, andesite, etc. This latter is usually associated with lime-soda feldspars of the plagioclase group.

PITCHSTONE contains no pitch or other carbonaceous matter. It is a compact, natural glass, with greasy resinous lustre. It occurs in beds or sheets, dikes and bosses. Hyalite is a glassy form of silica found in transparent and colorless form in basaltic lavas. Opal is an amorphous silica combined with water. It differs from ordinary quartz in being soluble in caustic potash, from which it can be precipitated by ammonium chloride. It occurs as an infiltration in vesicular cavities in trachytic rocks. It also occurs in "petrified wood," where the cellulose of wood has been replaced by the soluble silica.

FOR convenience in calculating the results of assays the assay ton is employed. It was devised by Prof. C. F. Chandler of Columbia College, New York. As ores of the precious metals, as well as those of base metals, are weighed by the avoirdupois system, while gold and silver are weighed in ounces troy, the basis of the system is the number of troy ounces in a ton avoirdupois of 2000

pounds, which is 29,166.66 ounces. The assay ton contains 29,166.60 milligrams. Hence if one assay ton of ore is taken for assay and a button obtained weighing 320 milligrams of gold, the ore contains 320 ounces of gold per ton, as each milligram in the assay ton is equivalent to an ounce troy per ton avoirdupois.

OF the seventy-one elements given in Dana's Mineralogy, five of them: oxygen, hydrogen, nitrogen, chlorine and fluorine, are gases; bromine is a volatile liquid; mercury is also a liquid, but all others are solids under ordinary conditions. The elements are divided into metallic and non-metallic classes. Metals are those having metallic luster, are malleable, opaque, conductors of heat and electricity, etc. The non-metals have none of these physical characteristics, being brittle, often transparent, and poor conductors of heat and electricity. The semi-metals, such as arsenic, antimony, bismuth, etc., have some of the physical characters of a metal, but are more or less brittle, and often take the part of an acid element in their combinations.

WHERE A locates a claim in Arizona in December, 1900, and performs the necessary "location work," records notices, etc., as required by the Territorial statutes, he is secure in his title until December 31, 1901, at midnight; but if he has performed no assessment work in 1901, as required by United States mining law, his claim is open to location at the date and hour above mentioned, and B locating in April, 1902, acquires the rights relinquished by A through failure to comply with the law. The subsequent return to the claim by A and the performance of any amount of work will not reinstate him in his forfeited rights. Had he, however, resumed work at any time in 1902, prior to the claim having been taken by B, he would have been secure.

HOUSEHOLD FILTERS are not often satisfactory. They must be cleaned frequently, and this with the ordinary home-made filter means a complete renewal of the entire filter bed. A filter when new will prove an excellent thing, but once fouled the filtered water is far worse than it would be without the filter. A filter made of sized gravel (coarse on the bottom) and charcoal makes a good household filter, but it must frequently be renewed. Little dependence can be placed on the various forms of stone and sponge filters, as they merely act as strainers and are quickly contaminated. Placing various chemical substances in water is too slow in its action to make it valuable. The best general remedy for water about the purity of which there is a doubt is to boil it.

WHERE tailings are permitted to run without obstruction onto the lands of others they become the property of the owner of the land, and where they accumulate upon unclaimed land they are subject to location in the same manner as placer claims. Where the deposit of mill tailings in a stream works an injury to another the case is actionable for damages sustained, but it is questionable whether under all circumstances a court of equity would find just cause for injunction. The court will consider the importance of the mining proposition and necessity for depositing tailings in the stream, as well as the injury done by them to others. While the miner is entitled to the free use of the stream to carry away his tailings, he has no right to fill the channel with debris, causing the stream to overflow and thus deposit the sand on the land of his neighbor.

It is difficult to prescribe a remedy to prevent "floured" quicksilver forming in a stamp mill without knowing all of the conditions under which the mill is operating. This must be learned by careful investigation. Some of the causes for this fine sub-dividing of the "quick" are too high discharge; too rapid drop of stamps, and consequently too violent churning of pulp in the battery; grease in the mortars from stems or elsewhere; overfeeding of "quick," with resulting soft plates; arsenical compounds in the ore, or in the water used; black oxide of manganese flours "quick." Sometimes mine water is employed in the mill, and causes the mercury to "flour" and "sicken." This was the case with a mine on Osborne hill, near Grass Valley, Nevada county, Cal., some years since, when mine water was employed in milling. Ore from the same stope sent to another mill gave good returns.

WHERE, in the progress of stoping ore from a vein or other mineral deposit, the workings reach the end line of a claim, the party removing the ore in the stope is required to give to his neighbor lateral support—that is, take such steps as seem necessary to prevent caving of the vein or ore body at the party line. Subsequently, should the face cave, and if the ore left standing falls into the stope previously excavated in the adjoining property, this ore is still the property of the person originally owning it; and should the party making the stope remove the ore and convert it to his own use, he is responsible to the proper owner for the value of the ore thus taken. The owner may remove the ore, however, through his own workings, even though obliged to go into the adjoining stope to recover the caved ore. Municipal law is the reverse of this, and the owner of a building adjoining an excavation must support his own walls and building.

IN steam boilers the usual value given to the term

"horse power" is the evaporation of thirty pounds of water at a temperature of 100° F. into steam at seventy pounds pressure above the atmosphere. The quantity of coal consumed in generating one horse power varies greatly, depending on the kind and condition of coal used, the size and kind of boiler, and to no small extent upon the method of firing—the personal equation being a large one where a mechanical stoker is not used. The most common causes for complaint in inefficient steam plants are poor draft, insufficient grate surface, poor coal, furnace not adapted to kind of coal, bad setting of boiler, leaks of air through brick work, improper firing, boiler too small, which means insufficient heating surface, bad water, and lack of water heaters and dampers in stack. The amount of coal burned per square foot of grate surface varies greatly. For instance, with good coal and a good boiler eight pounds of coal consumed per hour will require .43 square foot of grate surface per horse power generated, and forty pounds per hour will require but .09 square foot of grate surface per horse power generated. Thus it will be seen that power will be generated much more cheaply in a large boiler than in a small one. The cost per horse power of electricity depends entirely upon the power employed in generating it. The cheapest is undoubtedly that which is generated by the employment of free water power, and the most expensive that generated in a plant having inefficient boilers, poor quality of fuel and bad management.

THE table of hardness of minerals as given in "Dana's Mineralogy" is as follows: Talc 1, gypsum 2, calcite 3, fluorite 4, apatite 5, orthoclase 6, quartz 7, topaz 8, sapphire 9, diamond 10. The hardness is measured by the resistance which a smooth surface offers to abrasion. The degree of hardness is determined by observing the comparative ease or difficulty with which one mineral is scratched by another, or by a file or knife. When testing for hardness crystalline varieties with smooth faces should be taken as far as possible. Minerals of grade 1 have a greasy feel to the hand; those of grade 2 are easily scratched by the finger nail; those of grade 3 are readily cut by a knife blade; of grade 4, scratched by a knife; grade 5 is scratched with difficulty by a good knife; grade 6, barely scratched by a knife, but distinctly by a file. Minerals of this hardness will scratch window glass. Quartz, which has a hardness of 7, and all the minerals harder than quartz scratch glass readily, but are little touched by a file. The chemical composition of minerals seems to bear a direct relation to their hardness. Compounds of the heavy metals, as gold, silver, copper, lead, mercury, etc., are all soft, their hardness seldom exceeding 2.5 or 3. The compounds of the common metals—the sulphides (arsenides) and oxides of iron—are relatively hard, pyrite 6 to 6.5 and hematite 6. Nickel and cobalt are included in this class. The minerals which are conspicuously hard are found among the oxides and silicates, many of them being compounds containing aluminum, as corundum or sapphire, diaspore, chrysoberyl. The most common minerals having a hardness near or greater than 7, and having unmetallic luster, are quartz, garnet, tourmaline, spinel, topaz, corundum and diamond.

THE statutes of the State of Nevada provide as follows in the matters of making amended locations, or changes of boundaries: "If at any time the locator of any mining claim heretofore, or hereafter located, or his assigns, shall apprehend that his original certificate (of location) was defective, erroneous, or that the requirements of the law had not been complied with before filing; or shall be desirous of changing his surface boundaries, or of taking in any part of an overlapping claim which has been abandoned; or in case the original certificate was made prior to the passage of this law, and he shall be desirous of securing the benefits of this act, such locator or his assigns may file an additional certificate, subject to the provisions of this act; provided, that such relocation does not interfere with the existing rights of others at the time of such relocation, and no such relocation, or the record thereof shall preclude the claimant or claimants from proving any such titles as he or they may have held under previous locations." The law does not require that in making an amended location that the relocater shall state for what purpose he makes an amended location, but simply gives him that right, but does not permit him to appropriate any portion of a claim located by others, either prior to his original location or subsequently. Any rights or privileges obtaining under the original location extends to the amended location. All the assessment work for a group of claims may be done on one of them, but the work must be for the benefit of all, as a shaft on one of the claims where the same vein runs through all of the group. It is doubtful if the law would permit the work to be done on one claim where the several claims of the group were located on separate veins. The work may be done in a single tunnel to develop a number of veins lying beyond, and which are covered by several locations, as such tunnel development will manifestly be for the benefit of all the claims of the group. The discovery of a new or "blind" vein within the limits of a claim already located does not permit the owner of such claim to take anything beyond the boundaries of his original location, and in case of an amended location his privileges are confined to those lines. In no case can he encroach upon his neighbors. He obtains the extralateral right, however, the same as upon his originally discovered vein.

The Law of Faults.

Written for the MINING AND SCIENTIFIC PRESS.

The direction of throw of a faulted vein is not always easily distinguishable. Where the hanging wall and foot wall of the vein are wholly different, as lime on one wall and porphyry on the other, the direction of displacement is easily determined, but where both walls are similar, as slate or amphibolite schist, nothing but some sign of the direction of movement, such as the inclination of the contortion of the folds of the rock, or fragments of the faulted vein in the plane of faulting, affords a means of determining the direction of faulting. Faults are of two kinds, normal and reverse. In the former the hanging wall sinks relatively to the foot wall; in the latter, as the name suggests, the direction of displacement is reversed, and the hanging wall moves upward. This type of fault is also called a "thrust." Normal faults are of very common occurrence in sedimentary rocks, though reverse faults are also frequently observed. In crystalline rocks, however, the reverse or thrust fault is of very common occurrence. Sometimes faults stand vertical or nearly so, and the direction of throw in these is determined in the same manner as inclined faults. Faults do not always pursue a straight course, but change their direction in both strike and dip. In mines the veins are sometimes displaced by faults which have every appearance of veins, with gouge, crushed quartz and infiltrated calcite, etc., but contain no values. These the miners call "crossheads." The only distinction between a fault of this type and a vein is the lack of values in one of them, and the evident fact that one of them, usually the so-called "crosshead," is the younger—intersecting the older vein.

Veins are sometimes abruptly cut off by barren fissures and their continuation beyond is never discovered, but in most instances this is not the case. Faults are caused by internal stresses within the earth's crust, and the forces which produce the fissures which subsequently become veins by infiltration of gangue minerals and sulphides of the base metals, together with gold and silver, are the same as those subsequently producing the faults.

Such stresses are often evidenced along the plane of veins subsequent to their formation, this becoming apparent by the formation of heavy gouges, and polished surfaces in the quartz of the vein. Often this movement along the plane of the vein results in crushing the hard quartz into a mass of fragments, which become recemented by silica with more or less of the fine material derived from the walls of the vein, producing a mottled appearance. Rock of this description seldom has much value. At the side of a vein of this brecciated material may often be seen a banded, perfectly formed vein, that has apparently not been disturbed since its formation, and this may carry payable values in gold, both free and in auriferous sulphides. Veins of this description are not infrequently seen in California mines.

The stresses producing faults are not always sufficient to cause the rock to fracture, and in this event a line of torsion is the result. An instance of this character is found in the Ready Relief mine at Banner, San Diego county, Cal. There the rocks, mica slates, are contorted in a most remarkable manner, the result of a severe compressive stress, sufficient to crumple the slates, but not enough to cause an abrupt fracture. Along this line of crumpling and abrupt folding silica has been deposited in large quantities, in some places 20 feet wide, and with it gold and auriferous sulphides. In these "rolls" the structure of the original slates may usually be distinctly seen. Had this stress proceeded much further it would have resulted in the formation of a perfect type of fissure, having a dip of 45°, through a formation standing at about 70° from the horizontal. This folding must be the result of a long-continued pressure, for the rocks are not fractured, but bent and rolled upon themselves.

Were it not for the faults at Leadville, Colo., it is doubtful if the ore deposits there had ever been discovered. The ores occur in strata of limestone, intruded by dikes of porphyry. Other porphyry is injected in flat sheets between the several layers of the limestone and the quartzites of the region. The ore bodies are extensive, covering a large area, and occur at several geological horizons. It is believed that these ore bodies were formed at a depth of approximately 10,000 feet beneath the surface, then uplifted and the greater portion of the overlying strata eroded. The local faults displaced and folded the rocks of the district, bringing the ore beds to the surface in a series of steps, as it were, and it was the erosion of the exposed edges of these bedded deposits that furnished the carbonates of lead and galena to the placers of early days, the gold probably being mostly derived from the large ore bodies in the intrusive rocks lying east of the principal lead-silver mines.

Leadville owes much to the faults which made the deposits of ore available. The condition in that district is essentially the same as at Aspen, and in the northern portion of the Black Hills in South Dakota, and in some other mining districts where silver-lead ores occur in limestone with intrusive sheets and dikes of porphyry.

Faults are sometimes the result of local pressure,

as the mass of a mountain. A vein having its apex along the flank of a high hill or mountain and finding insufficient support on its lower side to sustain the weight of the mountain may be fractured and displaced from this cause. The Hillside mine in Yavapai county, Arizona, furnishes an illustration of this type of fault. The vein approaching the vertical in its dip is dislocated by a fault dipping westward at about 45°. This has resulted in the hanging wall side of the fault moving downward along the plane of the fault nearly 40 feet. At one place in the main gangway the fault was seen to displace the vein, but on the upper side of the fault plane was observed a vein within 2 feet of the vein below the fault. This upper section was apparently the upward continuation of the fractured vein beneath the fault, but had this been the case it must have been the result of a reverse fault. The condition of the wall rocks adjacent to the vein indicated that the fault was a normal one, and the section of the vein found above the fault plane was consequently considered as belonging to another vein lying to the eastward. A crosscut run subsequently determined this to be a fact. The wall rocks of the Hillside mine are in most part a light, silvery gray phyllite, dipping a few degrees from the vertical. Along the fault plane the folds of the rock were flexed by the movement, those on the upper or hanging wall side of the fault bending to the eastward, and those underneath the plane turned to the westward, so that in the face of the drift the formation locally had the appearance of lying flat.

Veins are frequently found displaced in mines, but, as previously stated, occasionally, unless some physical index remains to show the direction of "throw," it can only be determined by actual exploration. There is no "law of faults" which can be relied upon. The miner must study the indications as developed in his workings, and if these indications are lacking he must necessarily work out his own salvation. A knowledge of geology is very useful in studying faults. A great deal of time and money have been wasted by fruitless search for a dislocated vein by seeking in the wrong direction.

Natural Hydraulic Cement.

Natural hydraulic cement is made by burning lime rock which contains lime, silica, alumina, besides magnesia, iron, alkalies, etc., varying in quantity within tolerably wide limits.

The proportion of clay (silicate of alumina) combined with the lime in natural cement, it is claimed, should be 35% to 40%. Analyses of some of the best grades of natural cement are shown in the accompanying table.

The rock is quarried, broken and burned in a manner similar to that used in the manufacture of lime, but the burning is carried to higher temperatures. The burned material is ground to fine powder—the finished product—which, when properly mixed with water, will set, making a rock of stony hardness, and will endure for a long period either in air or water. It must be true, however, that a natural cement would ordinarily contain inert an excess of one or more of the substances used in its production, since the true combining proportions of a hydraulic cement can vary only within narrow limits.

An enormous quantity of natural cement is produced annually and used in all kinds of construction where hydraulic cement is in demand.

ANALYSES OF HYDRAULIC LIMES AND NATURAL CEMENT.

No.	Silica	Alumina	Iron Oxide	Lime	Magnesia	Carbonic Acid Water and Loss	Alkalies
1	24.33	1.92	...	71.91	...	...	...
2	29.71	5.35	3.29	59.53	9.95	...	...
3	28.39	11.71	2.29	43.97	2.21	2.44	9.00
4	26.69	7.21	1.30	43.12	19.55	1.00	1.13
5	30.00	11.00	1.50	34.00	16.00	...	...

1. Hydraulic lime, Lyme Regis, England. Used in the construction of London docks.
2. Eminent hydraulic lime, Hollywell, Wales. Used in the construction of the Liverpool docks.
3. Cumberland hydraulic (natural) cement, Cumberland, Md.
4. Akron hydraulic (natural) cement, "Cummings," Akron, N. Y.
5. Average natural cement. From Architects' Hand Book on Cements.

THE most widely spread of the iron bearing rocks of Ontario, as well as of the adjoining States, are siliceous, commonly of jasper or chert or white or gray granular silica, finely interbanded with magnetite or hematite, the whole usually more or less crumpled or brecciated and standing nearly vertical. The unchanged iron range rock seldom carries iron enough to be an ore, running usually below 35%, though some magnetic banded ores seem almost rich enough to be mined. The siderites often associated with them are not considered pure enough to be used as ores, since they are generally siliceous and contain considerable quantities of pyrites.

Stamp Milling and Amalgamation of Free Gold Ores.

NUMBER VI—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by DANA HARMON, San Francisco, Cal.

CONCENTRATORS.—Concentration is too broad a question to be discussed here; so much depends upon the characteristics of the metals and the gangues. In too many mills the crew is inadequate, so that both batteries and vanners suffer alternately as the solitary millman plods up and down stairs vainly attempting to do the work of several men. I have never seen a dozen belt vanners in any mill all working right for over five minutes at a time. For the average mill, and especially for the small mills, the concentrator should not be oversensitive; there is a wide difference in this respect between the various belt vanners. Don't pay much attention to the advertised competitive test records. What is wanted is a machine that will not go awry at every little variance of pulp, and that will carry a heavier load. The belt vanner requires some experienced hand at its side all the time.

I am glad to note that during the past two years there has been marked advance along the lines of the shaking tables of the Wilfley type. There are now on the market several styles, rectangular or circular, similar to the Wilfley, and the latter is itself a much better made machine to-day than it was two years ago.

Manifestly concentrators of this type, with the wide range in load of twenty to forty tons, will not be going wrong every five minutes. By supplementing them with classifiers, it is now possible to handle a hundred or more tons per day with greater precision and less trouble than we could ten tons formerly.

Where machinery is going constantly, the fewer parts to the machine and the fewer machines the better for the business. This is precisely the modern tendency in concentration. It would look as though the oil process of concentration was destined to satisfy some conditions where water concentration wholly fails.

COSTS.—Costs are always interesting as being the final test of value to our efforts and theories. I may therefore be permitted to give the results of one year of my work on a free milling ore with twenty stamps crushing 22,000 tons: Two amalgamators at \$3 50 each, and four helpers (includes rock breaker men) at \$3 each. Power water was bought; battery water came from the mine; in a deep snow country—4600 feet altitude. The quicksilver loss includes the mechanical losses from retorting, cleaning up, etc. The ore averaged \$4 65 per ton, only three of the twelve cleanups exceeding \$5 per ton. The tailings averaged about 15 cents per ton:

Water power—rock breakers	0093
Water power—batteries	0745
Labor, all including repairing	2112
Shoes and dies	0701
Mortar liners	0077
Replanting	0143
Rock breaker jaws, tappets, bosses, belting, extras, etc.	0287
Oil, lubricating	0031
Oil, lighting	0065
Screens, tin No. 2	0033
Quicksilver loss, .15 troy oz. per ton	0050
Firewood for stoves	0095
Sundries	0079

Total per ton..... 4491

The rock breaker costs were excessive because the ore was very tough as well as hard and the rock breakers were not as large as the ore required—they were therefore under heavy strain at all times. This is not an uncommon difficulty at a large number of mines, and should be at none.

RECAPITULATION.—To recapitulate; my argument runs in about this wise:

Use a stamp mill because no better machine for the purpose in hand has been invented.

Use a heavy stamp because it won't waste time and can be run slow enough to save wear and yet fast enough to churn and therefore amalgamate.

Have large shoe and die areas, so as to embrace plenty of rock at every blow.

Crush and also amalgamate, the limit of your crushing to be taught by the tailings assays.

Extract all the practically recoverable gold. If more stamps are needed, build them.

The speed and drop suitable can only be determined by assaying tailings.

Catch the gold close to the die.

Renounce chock blocks.

Don't slime by too fine crushing.

Beware of too much water.

Don't crowd the plate with too much pulp.

Have the plate sticky and pasty with amalgam, and never dripping with quicksilver.

Use a broad, steep plate and hang up when rub-

bing up; note the use of the word ruh, not wipe. Put elbow grease, and none other, on the plates.

Don't be parsimonious about replating.

Keep the quicksilver clean.

Sample automatically.

Battery water temperature not below 50° Fahr.; better at 65° or 70°. Use clean water only. Avoid slum water if possible.

Let your millman swallow all the patent medicines his stomach craves, but don't let him work off any nostrums and acids on your plates.

The Development of High-Pressure Centrifugal Pumps.

Written for the MINING AND SCIENTIFIC PRESS by
JOHN RICHARDS.

It is common opinion throughout the Eastern States that centrifugal pumping has reached a more advanced stage on this coast than in other parts of this country, and this is certainly true in respect to many, if not most, of the varied uses to which these machines are applied, especially as to an early use of the high-pressure type that is now engaging especial attention in all countries.

The writer has been several times requested to explain this matter and give some of the facts relating to this "evolution," especially in respect to what are called high-pressure centrifugal pumps. This I cheerfully do, because the principal facts and data are ascertainable, and in a few years will be lost, as is common in such cases; also for the reason that some legal proceedings now being conducted in the East involves the origin and progress of these pumps in this country.

Down to 1880 there had not been any regular manufacture of centrifugal pumping apparatus on

of the San Francisco Tool Co., of this city, was called upon to examine a pumping plant employed to drain one of the San Joaquin islands, near Stockton, that belonged to some of the shareholders of the San Francisco Tool Co.

The machines in use were found to be imperfect, and the writer recommended that a new and better pump be procured from one of the Gwynne firms, at London, with whose work he was familiar. There was no time for this, however, and he undertook the construction of a cheap centrifugal pump, which, with a new steam engine, removed the water and at the same time reduced the coal consumption from 4500 pounds to 1800 pounds per day.

This circumstance led to a contract with the city of Sacramento for a vertical draining pump to clear the surface water at the southeast end of the city; and this again to other pumps, especially for irrigating purposes, until a regular business was established, the San Francisco Tool Co. being sole makers on this coast.

Up to 1883, it was a common belief, even yet entertained by many people, that centrifugal pumps can not be operated against a head exceeding 40 feet; but, in October of that year, Dr. Chapin, who held the position of State Entomologist in California, called at the works to ascertain whether he could not procure a series of such pumps to raise water 83 feet on his ranch near Santa Clara, Cal.

I had little faith then, and now, in series pumps operating at different levels, and proceeded to design a pump, as shown in Fig. 1, in which the water passed consecutively through two impellers without being diverted from its plane of revolution normal to the axis.

Working drawings and a pump were made from this sketch and the pump was started at the Tool Co.'s Works in Stevenson street, by A. F. L. Bell, now of this city, first as a single pump, with one impeller left out.

The pressure attained at the speed arranged was

there, and a mechanic with whom a contract was made to construct a large two-stage pump to operate against 90 feet of head and raise 750 gallons per minute. This pump is shown in Fig. 2 and it is to be questioned if there has ever been another made with more precision and the same care in workmanship.

The work done by the San Francisco Tool Co. was at that time of a very high grade, mostly on machine tools, and the pump was as well made as an iron lathe or planing machine. It was erected in a narrow pit 80 feet below the surface, in a fixed position, and the season being a very dry one the water rose over the pump and there remained for ten years or more, the pump running each year from two to three months, night and day, raising sometimes at the rate of 1000 gallons per minute, and receiving during this time no repairs whatever, not even examinations, being submerged and inaccessible.

This is an example of endurance that proves the advantage of good work and strong proportions, but is by any standard a strange result. In 1898, after fourteen years of service, this pump was dismantled and raised to the light again. All the bolts and attachments had to be cut away because of corrosion, but the main parts were preserved by Louis Booksin until the present month, and have been purchased by the Turbine Pump Co. of New York, as a memento of early practice in stage pumping. The drawing, Fig. 2, was made from these parts.

In 1885 I went to Europe and made there some investigation and inquiry respecting centrifugal pumping, but found that no stage pumps were in use at that time, and it is a fair inference that the pumps above referred to were the first to be practically and continuously operated.

With the exception of some special pumps designed between 1885 and 1900, I gave no special attention to centrifugal pumps until the advent of the stage pumps of Messrs. Sulzer Bros. of Switzerland, who produced a refinement in such machines by a purely scientific treatment of construction that differed in respect to water ducts of careful proportions, a great increase in the rate of rotation and in the diffusion of water from the impellers that converted its kinetic energy into pressure.

This was an important advance; one that called for accurate and intricate workmanship, that however easy it might be attainable in this famous works was not attainable in common shops. In that year I set about an attempt to balance the impellers of stage pumps, to simplify and cheapen their construction, also attain an equal pressure on the sides of the impellers to prevent circulating leakage.

After several years of experiment these things have been accomplished in such degree that a new type of high-pressure pumps will soon be so far perfected that their construction can be submitted to the world through the usual channels.

Engineering effort in this direction on the Pacific coast is to a great extent a sequence of the extended use of water-raising and impelling machinery demanded by the physical circumstances of the country and its industries.

San Francisco, Cal.

Pyrites Deposits in Alameda County, California.

Written for the MINING AND SCIENTIFIC PRESS by
R. P. MCLAUGHLIN.

The Leona Heights pyrite mine is situated 4 miles east of Oakland, Cal., in a region commonly supposed to be worthless from the miner's standpoint.

A body of massive iron pyrites about 50 feet wide has been opened to a depth of 100 feet by two tunnels and a winze. The country rock is the metamorphic sandstone commonly found in the Coast Range of California, having been much folded and crushed. The hanging wall is black and schistose and soon crumbles upon exposure to the air. About a foot of white clay gouge frequently lies between the ore and hanging wall. The foot wall is soft, white clay. The sulphide is soft and crumbling on the foot-wall side of the ore body, but is hard and has to be blasted on the hanging wall side.

The mine has been substantially timbered. The walls stand well in most places, but in the ore body close lagging is usually required. Where stoping is going on square sets are put in. Fifteen men are employed in the mine. No inconvenience is experienced from water, the mine being dry.

The ore was formerly trammed out in cars and dumped into a bin, from which it was drawn into wagons, but a wire rope tramway has recently been installed, which will convey the ore about a quarter of a mile to the electric road running to Oakland. An endless 1-inch cable carries twenty-five automatic dumping buckets having a capacity of a quarter of a ton each. Power for the tramway is supplied by an electric motor situated at the upper end of the system.

The pyrite is treated at works on the shore of the bay. The chief demand is for the manufacture of sulphuric acid.

Several other localities in California furnish pyrites, notably the Iron Mountain Copper Co. of Shasta county and the Spenceville mines in Nevada county.

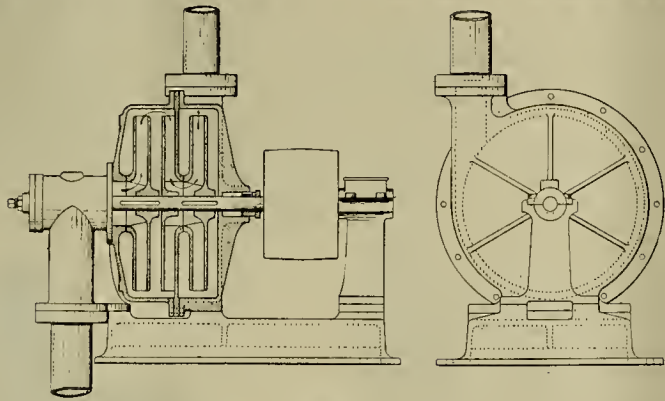


FIG. 1.

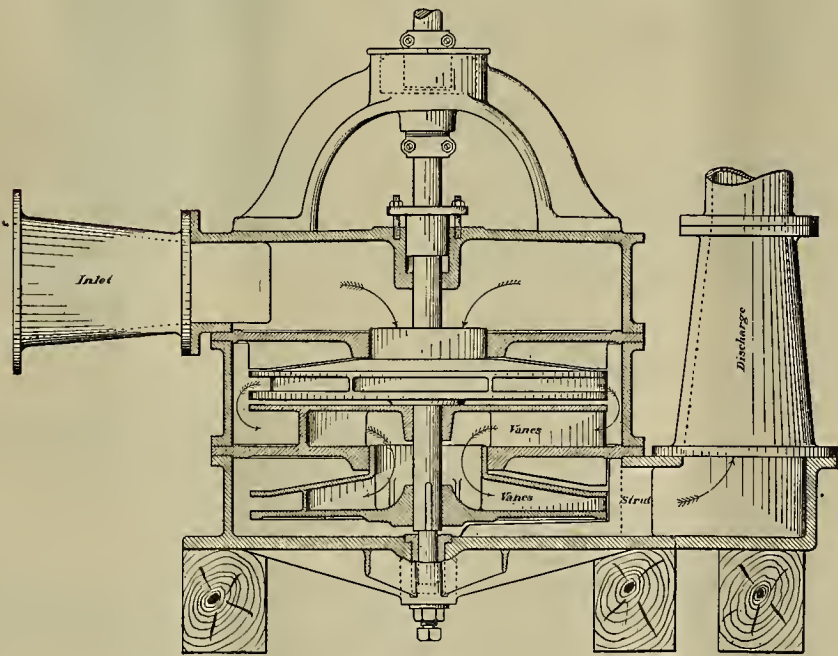


FIG. 2.

this coast. A great many of a cheap kind were imported here to replace reciprocating pumps for irrigating purposes, because the water when drawn from the gravel strata was filled with sand and fine gravel that soon cut away packing and destroyed sliding joints of any kind exposed to the water.

It was soon discovered that centrifugal pumps had no sliding contacts, no valves, and were not affected by the sand and gravel, and besides could be employed for large quantities of water. This and other reasons lead to the manufacture of such machines here, the circumstances being as follows:

In 1880, the writer, then a director and manager

30 pounds per inch. The second impeller was then put in and the pressure rose to double, or 60 pounds per inch, and a telegram was sent to Dr. Chapin saying the company would contract for a pump to operate at a head of 85 feet.

This pump was made, and erected in February or March of 1884 by C. H. Gorr, of San Jose, and was perhaps the first stage-centrifugal pump set in practical operation in this country having the distinct features of present practice, including the division plate and return passages between the impellers.

This pump attracted the attention of Henry Booksin, of San Jose, a prominent fruit grower

An "All-Fire" Method for the Assay of Gold and Silver in Blister Copper.*

By WALTER G. PERKINS, Grand Forks, B. C.

As this particular product holds a place by itself, it seems desirable to give a paper dealing especially with it. The process is first to convert the metallic copper into matte by the addition of sulphur, allowing the two elements to combine at the bottom of the crucible when heat is applied. The flux then acts on the sulphides, oxidizing some of the copper which goes into the slag, while the gold and silver are collected in the lead-button reduced by the sulphur. These buttons are combined and scorified twice, for the purpose of concentrating the values and eliminating the remaining copper, thus reducing cupel absorption-loss to a minimum.

CHARGE FOR A 20-GRAM CRUCIBLE.

Sulphur.....	800 0	mg.
Cu (approx.).....	0 083	A.T.
Na ₂ CO ₃ +K ₂ CO ₃ (½ and ½).....	0 5	A.T.
PbO (free from Ag).....	8 0	A.T.
SiO ₂	0 5	A.T.
Salt Cover.		

METHOD OF OPERATION.—Weigh out 0.25 A.T. of copper borings, divide it approximately into three equal parts, and place in 20-gram crucibles; repeat the operation until four sets have been weighed out, thus having twelve crucibles in all for one assay. Weigh 800 milligrams of pulverized sulphur into each of these and mix with the copper; then add one charge of flux, but do not mix the copper and sulphur with the flux, as these two elements should remain at the bottom of the crucible, to form matte when heat is applied. Shake down; fill the remaining portion of the crucible with salt (NaCl), and place in a dull-red muffle. Raise the temperature gradually for thirty or thirty-five minutes, at the end of which time some salt should remain, not quite molten, in the center of the top of the charge; this will melt and become fluid in a few minutes. The temperature should then be raised, so that, in forty-five minutes from charging, the muffle will be of a bright red color, the charge quiet and perfectly fused.

The success or failure of this method, especially the silver result, depends upon the proper regulation of the furnace. Therefore, a detailed description of the manipulation, as practiced by the writer, is necessary at this point.

The muffle used is 17x19x8½ inches, outside dimensions, in which twenty-five crucibles can be placed at a time. Twelve crucibles containing the blister copper charges should be placed in the front part of the muffle, so that the action can be watched carefully. In the back part of the muffle may be placed ore assays, etc., the results of which are not so easily affected by temperature.

The atmosphere in the muffle must be reducing; otherwise, as the charge fuses, the silver seems to come to the surface, and a portion of it is apparently oxidized (or volatilized) and lost in the slag, making the result from 0.4 to 1.0 ounce per ton too low. A muffle that has a good draught through it always has an oxidizing atmosphere when fired with coal; therefore, some artificial means must be resorted to in order to bring about the desired result. The practice here is to plug the holes in the back of the muffle with honeash. Then distribute five crucibles (which are about three-fourths full of fine coal and covered with 3 inch scorifiers) amongst the charge, thus: Two in the back row, one in the center and two in the front row of crucibles, closing the front with a tight-fitting door. This will reduce one to two grams of Pb from PbO, if a blank charge is run. In case a gas or gasoline furnace is used, the atmospheric conditions would probably be correct without resorting to artificial means.

POURING, SLAGS AND BUTTONS.—All conditions being perfect, the charge will pour very fluid. But care must be taken to rotate the crucible quickly, and tap sharply several times, in order to settle any fine shots of lead that may otherwise be held in suspension or adhere to small recesses in the walls or bottom of the crucible.

The slag, on cooling, should be a yellow silicate of lead at the outside of the cone, becoming finely crystalline and deep green immediately inside the outer skin. If more than merely the skin of the slag shows as a silicate, the heat has been too great; and if the entire slag is crystalline, with large coarse crystals pointing towards the center, the temperature has been too low, and has probably left some shots of lead in the crucible. The salt on the top of the cone will be of deep brownish red, the depth of color lessening when overheated or when the atmosphere of the muffle had an oxidizing effect.

The button from each crucible should weigh about eighteen grams, and break clean and bright from the slag. Care must be taken that a film of lead is not left on the slag where the button breaks from it, as a gas bubble that has a thin covering of lead appears to form at the top of the button, which adheres to the slag.

SCORIFICATION.—Each set is now represented by

three buttons weighing eighteen grams each. These are now scorified, to eliminate more copper and concentrate the values. The four sets, each representing 0.25 A.T., are manipulated as follows:

Place four 3-inch scorifiers in a hot muffle for ten or fifteen minutes; then, having reduced the temperature in the muffle to about the right heat to open cupellations quickly, place the sets of three each in the four scorifiers; close the door and the scorifications should open as quickly as cupellations. When properly opened, lower the temperature to a heat that will just permit the operation to be carried on successfully until covered. Raise the temperature until the slag is hot enough to pour freely; decant as much slag as possible without losing any lead; return the scorifiers to the muffle and allow scorification to go on until again covered; close the door to heat up the slag, and then remove the scorifiers and pour. Each resulting button will weigh about five or six grams, if the temperature has been kept low from the start.

SECOND SCORIFICATION.—Four 2-inch scorifiers are now heated as before. The buttons from the first scorification are broken down and the slags scraped free of any lead films on to a filter paper. Each 5-gram button is made up to twenty-five grams with C.P. test lead. The filter paper containing the button and test lead is folded and put into the hot scorifier. Conduct the operations at as low a temperature as possible, as these buttons will open easier than the first scorification. Raise the temperature when the buttons are nearly covered with slag, pour, cool, and break down again, watching for small amounts of lead on the slag.

These buttons are now ready for cupellation, and represent four assays of 0.25 A.T. each. Carry on this operation to get "feather" PbO on the cupels. This needs careful watching, as the buttons only weigh five or six grams. Weigh the heads for silver plus gold in 0.25 A.T. Combine two and two, part, and weigh for gold in 0.5 A.T.

SUMMARY.—1. The litharge must be absolutely free from silver, or, at the most, contain only small traces of silver, in order to avoid the necessity of correcting by difference. The kind used is of Pueblo manufacture.

2. The temperature must be carefully regulated in all operations. Also, have a slightly reducing atmosphere in the crucible operation, otherwise the silver result will be too low.

3. Great care must be exercised in watching for shots and films of lead, especially after the concentration of sets.

4. The cupels should be nicely "feathered," and when cold should be of a very pale greenish yellow, denoting the almost entire absence of copper. It is possible to get a good result by leaving more copper in the lead button, thus doing away with the second scorification. It is best, however, to do as directed, placing beyond doubt the question of the absence of copper in the silver heads.

5. The flux can be mixed in large batches and measured by having a cup made that equals one charge, the formula being:

Na ₂ CO ₃ +KCO ₃ (½ and ½).....	5 pounds
PbO.....	80 pounds
SiO ₂	5 pounds

6. The advantages of this method are:

That it gives results in gold equal to the "all-scorification" method, and in silver equal to the combined wet and fire method.

That it does away with the necessity of making separate estimations for gold and silver, thus saving the time and expense of working the combination method for silver.

That the time taken is less for each estimation than in the all fire scorification. In practice it takes from five to six hours to do three determinations of gold and silver.

Renewed Interest in Tin Mining.

The one metal absolutely necessary in the production of staple manufactures which has not been produced in this country to any extent is tin. Attempts have been made quite frequently to develop the deposits of this metal which have been discovered in various sections of the United States, but in almost every instance the deposits have either proved too lean to work satisfactorily, or the companies undertaking the problem of conducting operations have not had sufficient capital. It is interesting to note that renewed attention is now being displayed in this direction. Companies have been formed for operating in South Dakota and southern California, and they are announcing with confidence that they have not only satisfactory deposits of tin ore, but that sufficient capital has been secured to enable operations to be successfully prosecuted. It is to be hoped that the expectations entertained by these companies will be realized, and that this year may see tin produced on a commercial scale in the United States. This country is the largest consumer of tin in the world, and it would be decidedly beneficial to the consuming interests if this essential metal could be produced at home.—Iron Age.

An Automatic Tripping Device.

The Sherman automatic ore bucket tripping machine is illustrated herewith (Fig. 1). At the bottom of



FIG. 1.

the automatic tripper is fastened a heavy hook, which is hooked to the hals of the ore bucket or other receptacle. The buckets, together with the automatic tripper, are elevated and conveyed along the cable to the dumping place, when the bucket, together with the tripper just above it, is lowered, when the tripper by an automatic device will trip or empty the bucket at any point desired between the cable and the receiving bin below. At first the automatic tripper is set so as to dump the bucket close to the ground. As the pile increases in height the tripper can be changed so as to dump the bucket higher up. It can be changed to dump at any point by loosening a handwheel and changing the position of the pall. It requires no hand labor in emptying the bucket, an important item in handling ore, especially when emptying into cars from boats. The manufacturers state that it is strong and substantial and not

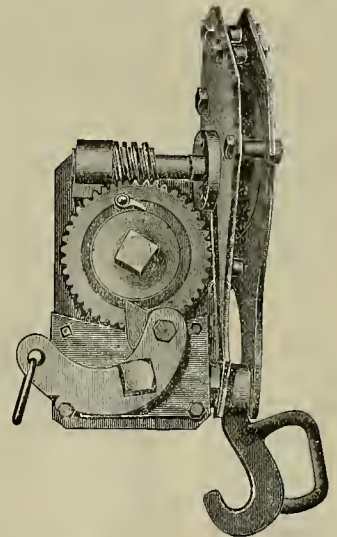


FIG. 2.

liable to get out of order. Fig. 2 shows the bucket just after being tripped or emptied by this automatic device. It is manufactured exclusively by the C. O. Bartlett & Snow Co., Cleveland, O.

Separation of Zinc Ores.

A new process presenting many remarkable features has been invented by G. D. Delprat and Mr. Carmichael of the Broken Hill Proprietary mine for separating particles of blende from the waste material of the concentration mills.

The principle of the process is simple. It has been found, that under certain circumstances, the particles of blende will float, while those of the rhodonite and quartz, which constitute the greater part of the remainder of the gangue, remain at the bottom of the liquid. This result, however, is not attained without a certain amount of chemical action, and this chemical action is rendered possible by the presence in the blende of a small proportion of sulphide of iron. Following well-known chemical laws, zinc sulphide in contact with certain acid solutions generates sulphuretted hydrogen gas. If the solution be sufficiently viscous, and the particles of blende sufficiently minute, the bubbles of gas remain attached to them, and raise them to the surface of the liquid, where by very simple devices they can be collected

for further treatment. During the experiments, which at the suggestion of Mr. Delprat were carried on by Mr. Carmichael, it was found that when the waste material from the mills, which, of course, was already finely comminuted, was subjected to the action of a hot solution of salt cake of rather high density, the particles of blende quickly rose to the top of the liquid in the manner described. This feature, which in laboratory practice would probably be regarded as an annoying hindrance, suggested a mode for separating the blende in larger quantities, and a small plant was devised to ascertain whether this is feasible. Experiments which succeed fairly well in the laboratory do not always bear out the expectations which have been formed concerning them, when attempts are made to put them into practice on a commercial scale.

The apparatus consists of a vat containing a solution of salt cake, brought by the addition of other salts (which are of an inert character), to a specific gravity of about 1.4 B. The solution is raised to a temperature of 195° F., and the bath is charged with waste material to a depth of about 1/2 inch. Separation begins immediately and the particles of blende rise to the surface. An additional quantity of the salt cake solution is poured into the bath, and the overflow carries the blende, which has thus been raised to a proper receiver, the salt cake solution as it drains away being again utilized in the bath. The process, it would appear, can be carried on either intermittently or continuously. Both the zinc product and the tailings or residue are afterwards washed in order that the salt cake adhering to them may be recovered by evaporation. By this expedient the loss of chemicals is small. It is also possible, Mr. Delprat states, to recover either zinc or lead ores by the use of nitric acid and nitrate of soda.—Australian Mining Standard.

The Friction of Steam in Pipes.

Among the theses presented by the class of 1902 of the Virginia Polytechnic Institute was one by W. L. Obewning and W. P. Tams, Jr., on the friction of steam pipes. This contained several diagrams plotted from tables prepared particularly for the use of designers of power plants sent to the Engineering Record by Prof. L. S. Randolph because of the use

pressure in pounds per square inch causing the motion, d is the diameter in inches of the pipe, w is the density of the fluid in pounds per cubic foot, and l is the length in feet of the pipe. If W is the total weight of the fluid discharged per minute, $Q = W \div w$, and the equation can be written in the following form, $p = W^2 w l + c^2 w^2 d^5$, but $W = k w d^2$, where k is a constant, hence

$$p = k' w l v^2 + d \quad (2)$$

If formulas 1 and 2 are compared, it will be seen that the only difference in form is the introduction in the latter of the density. According to the Italian experiments, the value of c in $Q = c \sqrt{pd \div w l}$ is 58, and this value might be used in determining k' .

A modification of this formula was introduced by G. H. Babcock and used by him in the computation of his well-known tables issued by the Babcock & Wilcox Co. It is

$$W = 87 \sqrt{(w p d^5 \div 1 [1 + (36 \div d)])} \quad (3)$$

Comparing this formula and that of the Italian authorities, it will be seen to allow for a variation of the constant for different sizes of pipes. Thus, for a 1-inch pipe, the constant would be 40.5, for a 3-inch pipe 58.6 and for a 10-inch pipe 74.8. This formula was employed in computing the tables plotted in the accompanying diagrams. For changes in the initial pressure multiply the values in the diagrams by the ratio of the densities at the new and old pressures. The loss caused by a globe valve is stated to be about equal to $114d \div (1 + [36 \div d])$. The loss caused by elbows is two-thirds that due to globe valves.

Winding Plants for Great Depths.*

There is much in suggestions made by Mr. Behr with which I cordially agree, among other matters the recommendation to investigate the requirements of every particular case before discussing the winding engines required. The requirements that the writer wishes to be most discussed are the conditions ruling on the Witwatersrand fields. To make this intelligible to those who have not visited them, or have not specially studied them, it will be necessary to bring forward some facts and principles.

The gold on the Witwatersrand is contained in beds

future, the earlier accounts showing expenses as high as 50s to 60s, whereas the monthly returns given by fifty-six companies for 1899 indicate an average working cost of 27s per ton. Consequently, judging from the past, and assuming an equal yield for the future, a deep level proposition would have as a basis for estimation, for moderate depths, a deposit capable of yielding an average return in profit of say 14s 6d per ton; for the entire section alone, a profit of 17s 6d per ton.

Working at great depths is handicapped by the following factors: The greater length of time necessary to make the ore deposit interest producing; the liability of encountering temperatures detrimental to economical working; the danger of encountering great quantities of water and the extra cost of pumping; the extra cost of hoisting ore, men and materials.

The first factor is pertinent to this discussion. It is clear that no delay must occur due to inefficiency of the winding plant, and that system of sinking must be adopted which will insure the greatest speed, for it must be remembered that the sooner the treasury is unlocked and made interest producing the more valuable it will be, and thus, even at the expense of greater cost, every possible effort should be made to reach the reefs as soon as possible.

Factor No. 2 has no direct, but an indirect, bearing on the subject of winding plants through ventilation. It is, of course, desirable to minimize the temperature underground by bringing large quantities of cooler air from the surface. This factor would thus enter into the proportion and size of the shafts to be adopted in connection with deep winding, and it is obvious that the system of winding which least impedes ventilation will be desirable.

Factor No. 3 has a most decided and vital bearing on the designing of hoisting plants. It is considered by many competent engineers that a well-balanced hoisting engine can raise water through a straight shaft from great depths at almost as low a cost as any pumping plant that has been designed. It is also most vital for these fields on account of the existence of acid water. Some mines, such as the Robins-Gold Mining Co., have suffered such inconvenience on this account, by corrosion of pump valves, chambers and pipes, that they, even now, are making preparations to handle their water in this manner. It is also an enormous advantage, in connection with the sudden inflow of water, to have a system which will aid the pumping plant in an emergency. Certainly the two-stage system of hoisting is very deficient in dealing with this problem, which makes it almost imperative to use the single stage where possible.

These statements of the Rand conditions show that there is no great margin for extravagances in any line if the proposition of deep mining is to be made attractive to capitalists. It is self-evident that the sinking of large deep shafts, and equipping them with the necessary pumping, hoisting, air and electrical power, requires very large outlay, and that the fewer of such shafts that a company possesses the more profitable will be the venture.

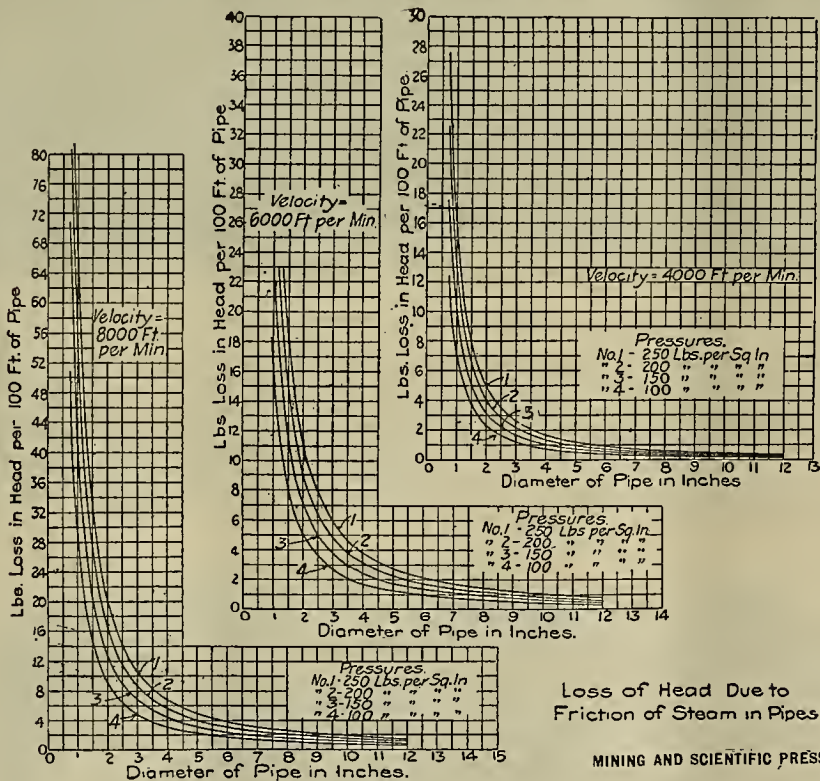
The average companies respectively have a claim area of about 185 for parent or outcrop companies, 216 claims for the first row of deep levels, and 291 for the second row. The tonnage that a claim will produce is not only dependent on its area of 60,000 Cape square feet, but also on the dip of the reef, its width, and its freedom from dikes, faults and barren ground. We shall assume for an average milling basis 30,000 tons per claim, allowance being made for sorting, faults, barren ground, etc., and a dip of 26°.

In the central portion of the Rand the existence of the reef has been tested by the Turf Club borehole to a depth of nearly 5000 feet. The horizontal distance from the outcrop to this borehole is 8565 feet, and the average dip of the reef from the apex to the point where it is intersected by the borehole is 29°, but, estimating the dip from the lowest workings shown in the Ferreira Deep shaft to the bottom of the borehole, the inclination of reef is about 26°.

With these facts before us, the questions to be settled are what is the most advantageous area for a deep level company, and what demands will be made on hoisting engines which are designed to exploit it.

The first condition for a deep level company is that it should have shafts capable of exploiting and ventilating its mining area, and thus be self-contained, and that it should make the maximum use of its costly vertical shafts. Thus we will assume two shafts (it is practicable to join them expeditiously when 3000 feet apart) of a maximum depth of say 5500 feet, and large permanent inclines extended on the average dip of the reef, but not following its faults and sinuosities. In connection with these main inclines it will also be necessary to have three subsidiary inclines, which need only be equipped with light hoisting machinery to command a depth of say 500 to 1000 feet, and at each 1000 feet the engines can be lowered. Trimming to the main incline shafts from the subsidiaries can also be done mechanically. The subsidiary inclines would be flexible, and could be placed to the best advantage in accordance with the mining conditions met with. The number of claims would be approximately 600.

The system of subsidiary inclines has the advantage in contradistinction to a greater number of shafts



ful data it contained. The introduction explains the general form of the equation for the flow of steam by comparing it with that for water. For the latter, assuming there is no friction, h , the loss of head, is equal to $v^2 \div 2g$ by the law of falling bodies. Friction exists, however, and varies directly as the length, l and inversely as the diameter d , so that the actual flow is more closely represented by $h = flv^2 \div 2gd$. Since $2g$ is a constant, this equation can be reduced to the well-known Weisbach expression

$$h = flv^2 \div d \quad (1)$$

As water is almost incompressible, its density is not taken into account, but this must be done when the flow of steam is considered and the above formula modified accordingly. Experiments made under direction of the Italian Government many years ago show that the usual formula for the flow of compressible fluids through pipes could be used for steam. This formula is $Q = c \sqrt{(pd \div w l)}$, where Q is the volume in cubic feet per minute, p is the difference in

of conglomerate composed for the most part of quartz or siliceous rounded material. There are several series of beds, but the one in which most gold occurs is known as the main reef series, which is divided into several hands. This series, as worked, shows on an average two beds justifying exploitation. Their distance apart varies from a few feet to 200 feet. The thickness of a payable reef varies from a few inches up to 12 feet. As an average, it may be considered that the two reefs will give a width justifying stopping of say 8 feet. These beds have been traced for a great lateral extent, the distance from Randfontein to Modderfontein along the line of strike being 53 miles. The section which is considered most reliable, and in which one profitable mine follows another almost without a break, is between the Langlaate Estate mine on the west and the New Comet on the east, a distance of 15 miles.

Working expenses in the early history of the fields were very much higher than they should be in the

*Hennen Jennings, in the London Mining Journal, (condensed).

connected with the surface—in fact, they can be made to conform to faults and disturbances met with, which could not be calculated upon in starting work from the surface.

The main shafts from the surface have seven compartments, and are 42 feet by 6 feet 6 inches in the clear. Shafts of this size are suggested for the following reasons: A large compartment is required for the necessary ladderways, air pipes, electrical cables, etc. Two hoistways will be necessary for the lowering of men and material, and two hoistways will be necessary for the winding of ore and water. The remaining two compartments are suggested with the object of improving the ventilation, and as a reserve in case it might be advisable to employ another winding engine either for water or ore, or both. These reserve hoistways can at first be bratticed, and, in connection therewith, an exhaust fan can be installed. The artificial ventilation thus introduced will greatly aid the speedy connection of the two main shafts and improve the ventilation of the whole development work prior to the two shafts being connected and the establishment of ample winzes.

When the connection has been made and ventilation established, a second hoisting engine can command these two extra compartments if the mine requirements justify it, and, even if the compartments are not required for further hoisting, they will aid the natural ventilation.

With the thin reef shown, the question arises: How many stamps can all these points of development employ, and when can they be started? The vertical shafts might be sunk and the necessary development work accomplished to start 100 stamps in say seven years, 200 in eight years, 300 in ten years, and 400 or 500 stamps between eleven and twelve years after the work was first started.

Let us assume that one hoisting engine at each shaft could deal with the ore problem up to 300 or 400 stamps, and we find that 300 stamps require a maximum of 42,500 tons of rock per month (weight of stamp 1250 pounds). If the ore is subjected to a sorting of 25%, on the surface, we should have to take from the mine 14,166 additional tons of rock. In addition it will be necessary to hoist waste rock in connection with development, but, as this will be mostly milled if taken from drives on the reef, a safe allowance would probably be say 300 tons a day. We thus have a total of say 2480 tons of rock to be hoisted from two shafts each working day, or twenty-six days per month. Consequently each engine must have capacity to raise 1240 tons in twenty-four hours. Even with 400 stamps, the total amount of rock would be only 1650 tons for each engine.

In this connection it is interesting to note some statistics of the Rand Mines, Ltd., showing the total cost of opening and equipping their properties. On a claim basis the average cost for nine companies is shown at £2846 per claim, and on a stamp basis £4253 per stamp. Multiply the area (600 claims) by the equipment cost per claim, and the cost of opening and equipment would be £1,707,600; and if £4253 be taken and multiplied by 400, almost the same figure is arrived at, viz., £1,701,200, showing that 600 claims for 400 stamps is the ratio in practical operation with the subsidiary companies of the Rand Mines, Ltd., at the present time. The fact, however, that with only 400 stamps the life of the mine from the commencement of milling would be some thirty-six years shows that, if possible, we should attempt to increase the output and make use of the reserve compartments and run 500 or 600 stamps.

I agree with Mr. Behr that, after reaching the reef, the only method to adopt is an independent equipment underground. The main incline shafts must have the same capacity for output as the vertical shafts; but on an angle of 27° a load of 17,621 pounds can be hauled with the same power as 8000 pounds in the vertical shaft. The weight of the rope is also taken up by pulleys on the incline, so that in the distance shown on the plan—5350 feet—the incline hoisting engines would only need to have power equivalent to hoisting 2429 feet in the vertical with the same factor of safety. In the arrangement for transferring ore from the incline to the vertical it will be noticed also that the main vertical shaft is across the formation. This allows of the most advantageous planning of the underground work when independent hoists are used, and the most disadvantageous method if it is desired to continue sinking from the surface on the incline, as well as from the vertical shafts, which system can only be advocated for moderate depths, and is utterly out of the question at 5500 feet.

If a depth of say 5500 feet can be reached in one stage, mining could be conducted to a depth of say 8000 feet by two sets of hoisting engines, one on the surface and the other un-

derground, hoisting on the incline. Mr. Behr's recommendations would require two winders on the surface for the vertical and one underground for the incline.

The Brownell Frue Vanner.

The Brownell Frue vanner, illustrated herewith, is claimed to be an improvement in durability, general construction and ease of manipulation over the regular machine, improvements being added, and some things which were a source of annoyance in the old vanner discarded, but all the desirable points of the Frue being retained. While a general description of the Brownell Frue vanner is not necessary some of the claims made for this concentrator, as illustrated, are that it is constructed entirely of iron, thus doing away with the cumbersome wooden frame; the side rails of the shaking frame are made of 3-inch channel iron, which are squared and held securely in position by tram or cross-rods; the 13-inch galvanized iron rolls that carry the main belt are beveled 3 inches back from the end, thus giving the roll a crown, and as the carriage frame is held perfectly square, the causes of the large belt traveling to one side are designed to be reduced to a minimum.

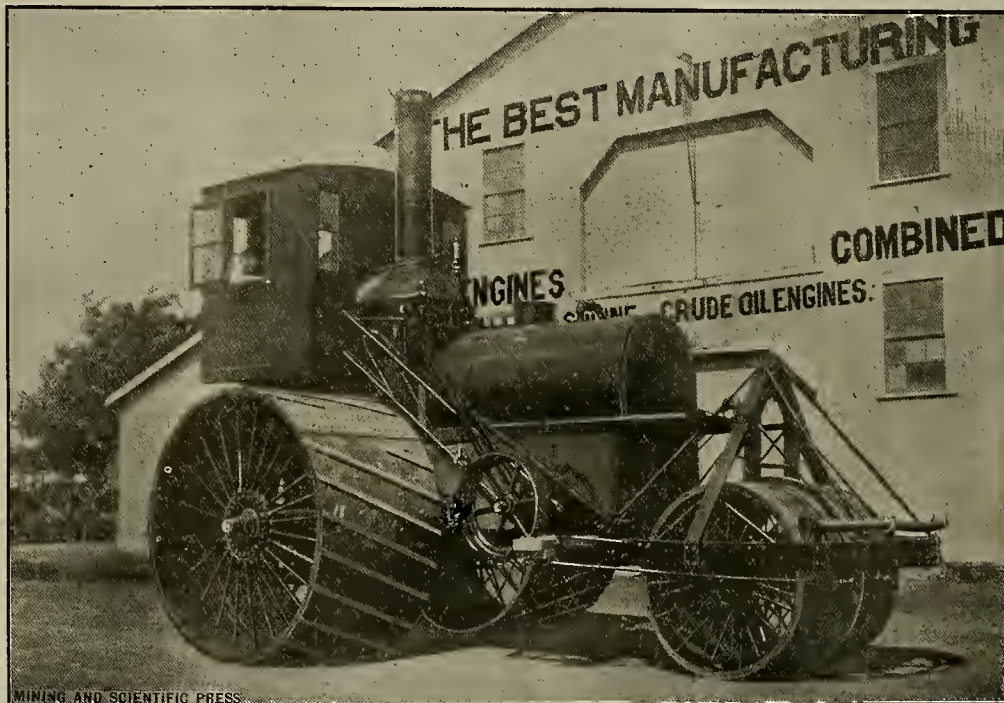
There is also introduced a new arrangement for stopping and starting the uphill travel of the main

carriage frame causes the end of the spring to wear the head of the drive-crank, so that after a few months the spring makes considerable noise. The drive spring, crank and collar have been discarded and an entirely new method of controlling the speed of the large belt has been introduced. Instead of a grooved pulley on the worm shaft a cone pulley is used, thereby enabling the attendant to increase or decrease the speed of the large belt by a slight movement of the hand wheel at the head of machine that controls the belt guide.

J. S. Brownell is the Western manager of the Frue Vanning Machine Co., room 15, 132 Market Street, San Francisco, Cal.

Large Traction Engine.

Herewith is illustrated a 110 H. P. traction engine recently built by the Best Manufacturing Co., San Leandro, Cal., for the Middle River Co. of Stockton, Cal., for use on the islands in the San Joaquin river where the soil is exceedingly soft. The drive wheels are 8 feet diameter, 5 feet face. The front or steering wheel is 50 inches wide, 64 inches diameter. Oil fuel is successfully used. The price of the machine is \$6500. Its special features are the great bearing surface of the carrying or drive wheels which enables

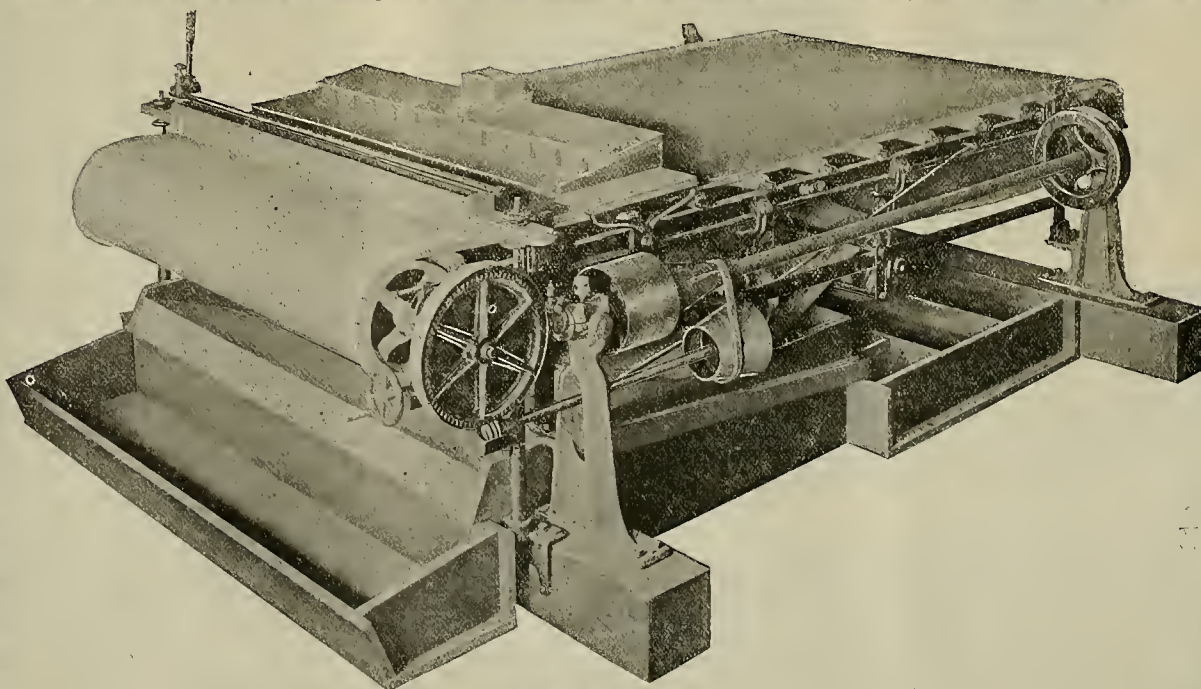


A 110-H. P. Traction Engine.

belt, accomplished by the slight movement of an eccentric in the hub of the worm-wheel guard, thereby disengaging the worm from the worm-wheel. The hangers that support the main and tightener rolls have double arms so that they are quickly placed in position.

The drive spring as used in the regular Frue has been a source of annoyance. The movement of the

it to go on ground and work successfully (although its weight is nearly twenty tons), where it would be almost impossible to drive a team of horses. It is particularly adapted to such soft sediment ground as that on the islands in the San Joaquin and Sacramento, Cal., rivers, where the soil is light and soft, and in the summer time so badly cracked that it is unsafe to work horses, and the dust so fine and light



The Brownell Frue Vanner.

in the dry season that neither man nor beast can stand it. It was necessary to build a dust-proof cab in the engine and use a blower operated by the engine to blow the dust out of the cab, so the engineer can breathe and see what he is doing. The Best Manufacturing Co. of San Leandro, Cal., report considerable demand for these engines.

The Stonewall Mine.

The Stonewall mine, in San Diego county, Cal., lies in a valley on the south side of a large artificial lake, called the Cuyamaca reservoir, near the summit of the Cuyamaca range. Pine and oak timber are abundant and the scenery is picturesque. The geological conditions under which the Stonewall mine is found finds a similarity in many regions of mica schist and mica slate. The veins are lenses of quartz occurring in the schist, usually disconnected, though often succeeding each other at short intervals for a considerable distance, and following along the same general strike. Sometimes these veins or lines of stress are accompanied by dikes, usually pigmatite or aplite. The quartz generally has a granular structure, with vitreous luster, and while such rock



Hoist and Shops, Stonewall Mine, San Diego County, Cal.

is usually condemned by prospectors as "unfavorable" to gold, yet quartz of this description is frequently very rich in gold. Mines of similar character are found in the Potter Ridge district of Madera county, Cal., in the southern Black Hills, South Dakota, in Canada, and in Georgia and the Carolinas.

In the vicinity of the Stonewall mine are large masses of norite, forming the highest peaks and ridges of the Cuyamaca mountains, extending many miles in a northerly and southerly direction. These rocks resemble the luster-mottled rocks of the Lake Superior region, but, so far as known, no mineral veins or deposits of value are found in them. The Stonewall mine, after an idleness of several years, is now being reopened. The accompanying illustration is that of the hoist. It has a 20-stamp mill and other machinery.

The Mesh of Wire Screens.

Written for the MINING AND SCIENTIFIC PRESS by
M. P. REYNOLDS.

It is generally understood by users of wire screens what is meant by the mesh of the screens—for instance, that 30-mesh has 30 openings to the lineal inch, or 900 openings to the square inch—but, unfortunately, the size of the wire used is not considered as seriously as it should be, although it really regulates the size of opening. This matter is of vital importance and a careful study of this point will reveal the fact that by varying the size of the wire it is possible to obtain the same size of hole in a number of meshes. The following will illustrate this feature:

STEEL WIRE CLOTH.

No. Meshes per Inch.	No. of Wire.	Decimal of Wire.	Size of Opening.
16	21	.032	.0305
18	23	.025	.0305
20	25	.020	.0300
22	29	.015	.0300
24	33	.011	.0300
26	36	.009	.0295

All of the above have practically the same size of opening, although there are six different meshes; therefore, it is the mesh and size of wire combined that must be taken into consideration when selecting screens to do a specified sizing.

All milling propositions are confronted with the question of screens, and in stamp batteries, jig

screens, trommels or mills of the Huntington type it is rather a complex problem, unless you have a list whereby a comparison can be made showing the various meshes with the respective sizes of wire in which they can be made and stating the size of the opening in each instance.

A catalogue issued by the W. S. Tyler Co., Cleveland, O., illustrates this feature, and a list taken from a page of the book is shown herewith:

IRON OR STEEL WIRE CLOTH.

No. Meshes per Inch.	No. of Wire.	Decimal Size of Wire.	Size of Opening.	Price per Sq. Ft.
23	27	.017	.0187	\$0.77
23	28	.016	.0197	0.65
23	29	.015	.0207	0.55
23	30	.014	.0217	0.46
23	31	.0135	.0222	0.35
23	32	.013	.0227	0.30
23	33	.011	.0247	0.26
23	34	.010	.0257	0.23
23	35	.0095	.0262	0.19
23	36	.009	.0267	0.17

30	28	.016	.0173	0.66
30	29	.015	.0183	0.56
30	30	.014	.0193	0.47
30	31	.0135	.0198	0.37
30	32	.013	.0203	0.31
30	33	.011	.0223	0.27
30	34	.010	.0233	0.23
30	35	.0095	.0238	0.20
30	36	.009	.0243	0.19

The efficiency of any screening apparatus depends upon the wise selection of the screens, and by keeping in mind the size of the opening, as shown in the above list, a screen can be chosen that will do sizing to the degree of fineness desired.

Another reason why this matter is important is because the heaviest wire can be selected that can be made to a given size of opening, thereby securing a screen that will be especially heavy and durable. Experimental runs are usually necessary to make a final decision as to which is the most efficient screen, but by considering the size of the opening feature and comparing the various sizes these experiments can be conducted intelligently and changes can be made from one size to another as the sizing of the screened product may direct.

Screens should be made with an even corrugation in both the warp and the shute wires, for screens of this character hold the mesh so firmly that the wires cannot shift from their original position, but screens which are made with the wires one way with a decided crimp, and the other way practically straight, are liable to cause endless trouble by the wires slipping out of place, rendering the screen worthless as far as even sizing is concerned.

The treatment of wire screens by the cold-rolled process according to recent experiments effectually prevents blinding or clogging, thus making it possible to increase the tonnage of a mill without increasing the crushing capacity. In trying out a scheme of this sort it is well to remember that it is false economy to secure the longest possible life of a screen and yet sacrifice the capacity in tons.

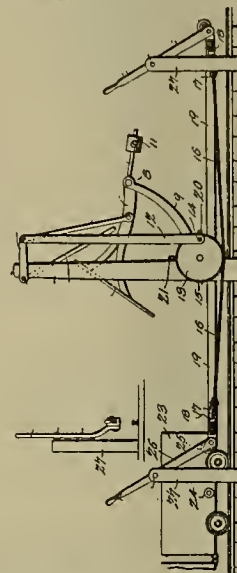
THERE are numerous isolated mining districts in the arid regions of the Southwest where the natural conditions are unfavorable to development and operation of mines, so long as the mine owners act singly, but these obstacles might be overcome if concerted action were taken to improve these conditions, in the way of obtaining water supply, providing good roads for cheaper transportation and securing milling facilities.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 10, 1903.

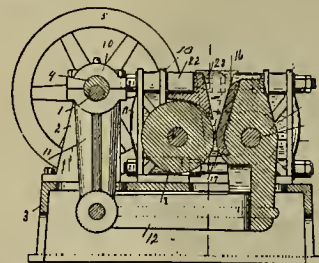
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINE CAR OPERATED DOOR.—No. 719,577; A. T. Flint and I. Whitney, Oskaloosa, Iowa.



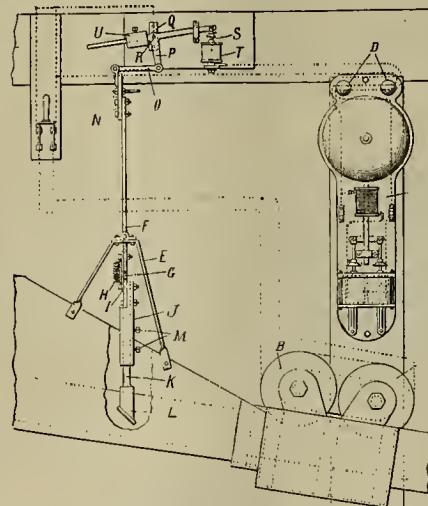
Combination of mine door composed of upper and lower sections, upper section being hinged at top and lower section mounted independently of upper section and movable in opposite direction, whereby pressure of air on door will be equalized, and means for connecting sections to cause same to move in unison and for actuating sections.

PULVERIZING MACHINE.—No. 719,503; L. S. Pfouts, Canton, Ohio.



In pulverizing machine, rotating roll, oscillating jaw having portion extended below axis of jaw and located at one side of vertical axial plane of rotating roll, right-angled arms or extensions extending from oscillating jaw beyond vertical, axial plane of rotating roll, and pitman connected to free end of extended arm, and means for reciprocating pitman.

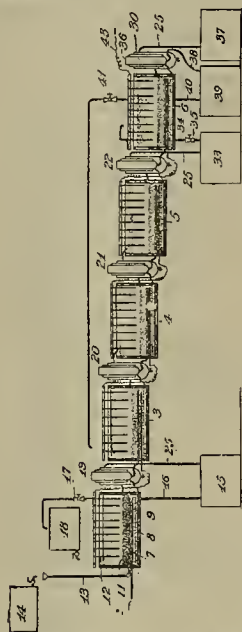
MAGNETIC SEPARATOR.—No. 720,156; J. Kirschweng, Butte, Mont.



A magnetic separator comprising chute, an electro-magnet, electric switch, swinging arm pivoted above chute, upper end of which is adapted to operate switch and lower end of which consists of separate piece hinged to upper end, and spring to hold lower end normally in alignment with upper end, arm being so arranged that its lower end may be actuated by accumulating material whereby when chute be-

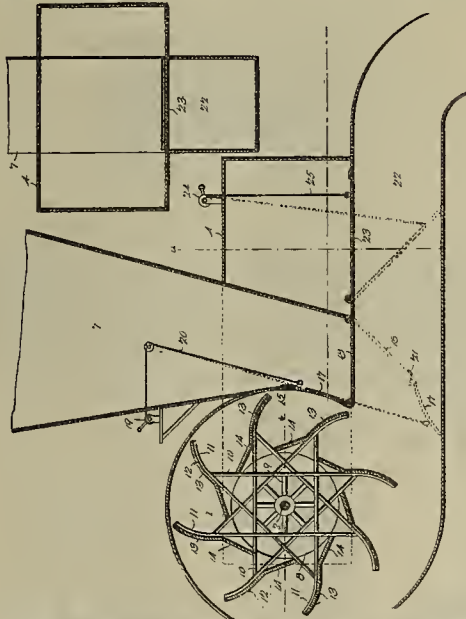
comes choked circuit is closed to give alarm, alarm being absolutely continuous and without intermittence.

PROCESS OF RECOVERING AND SEPARATING METALS FROM THEIR ORES.—No. 720,235; H. A. Frasch, Hamilton, Canada.



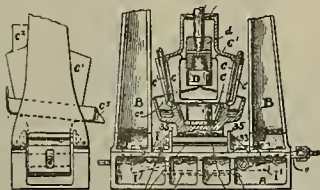
Method of recovering copper and separating nickel and cobalt from matte or ore by electrolysis, which consists in providing system of electrolytic baths with soluble anodes composed of matte or ore to be treated, supplying anodes of any desired number of system of baths with solution of salt of alkali whose acid or halogen radical is capable of combining with metal represented in anodes, supplying cathodes with catholyte of different specific gravity, and regulating overflow of anolyte and catholyte by means of difference in specific gravity.

VENTILATOR FOR MINES.—No. 720,264; D. F. Lepley, Connellsville, Pa.



Drum having intersecting flues 7, 22, leading tangentially therefrom, common cutoff located at intersection of flues to close communication between drum and either of flues, by-pass connecting one of flues and intake of drum, by-pass having air opening and closure therefor, and valve to open or cut off communication between by-pass and flue with which it connects, in combination with revoluble fan or blower mounted eccentrically in drum, and closely approaching common cutoff, when the latter is in position to close communication between drum and flue 7.

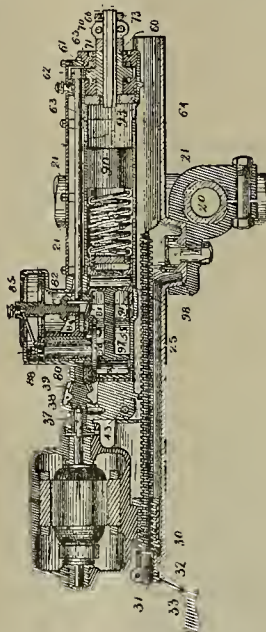
STAMP MILL.—No. 720,054; W. S. McKinney, Chicago, Ill.



In stamp mill, combination of frame, stamp reciprocating therein, mortar carrying die in alignment

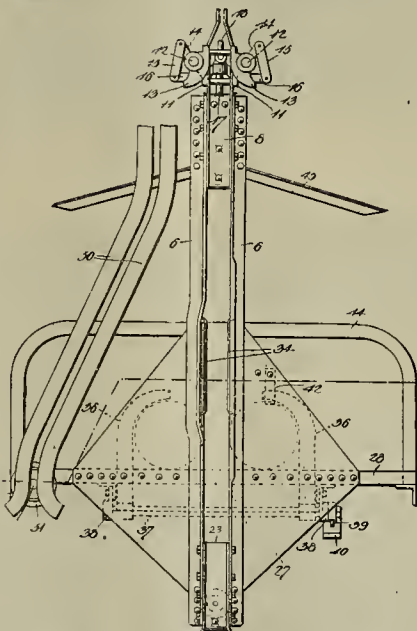
with stamp, wedge supporting mortar and comprising pair of blocks having oppositely inclined contacting faces, nut pivoted in each block, reversely threaded screw rod engaging nuts, and pair of links pivoted to frame and connected screw rod.

DRILL APPARATUS FOR DRILLING ROCK, MINING, ETC.—No. 720,319; W. A. Box and E. Y. Sayer, Denver, Colo.



In drilling apparatus, combination of guide frame adapted to be suitably held in position, drill shell or housing mounted to travel thereon and provided with instrumentality for giving travel to it, drill or tool, drill operating mechanism arranged within shell or housing, and mechanism for continuously rotating drill, housing having detachable portion provided with bearings for rotary parts of both drill operating mechanism and mechanism for rotating drill, principal parts of mechanisms being free to be drawn apart when detachable portion of housing is detached.

MINE CAGE.—No. 720,265; D. F. Lepley, Connellsville, Pa.

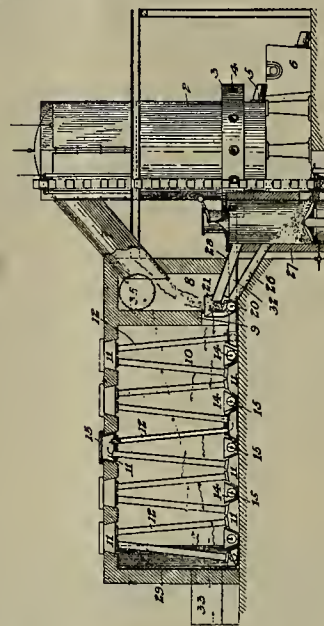


Combination with recessed guide timbers, of mine cage having main guiding members adapted for contact with opposite sides of guide timbers, tilting platform pivotally supported by guiding members, guide shoes carried by portion of platform structure at points above level of platform and adapted for contact with guide timbers at point intermediate length of main guiding members, shoes being adapted to pass through recessed portion of timbers on tilting movement of platform, inclined tracks supported at point adjacent to upper limit of movement of cage, and means carried by platform for engaging inclined tracks.

METHOD OF CONVERTING COPPER MATTE INTO METALLIC COPPER.—No. 719,488; G. Mitchell, Naco, Ariz.

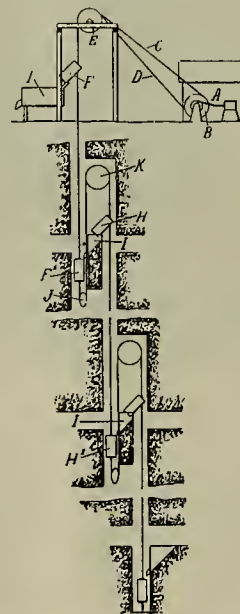
Method of converting copper matte into metallic copper, by charging molten matte into acid or basic-lined converter and feeding practically pure silica in molten condition into molten matte while it is being blown to metallic copper.

COMBINED DUST CATCHER AND BLAST HEATER.—No. 720,257; W. E. Koch and J. W. MacDonald, Pittsburg, Pa.



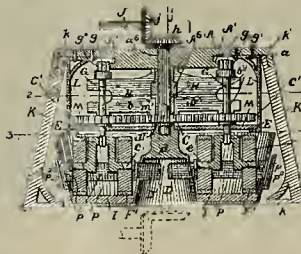
In smelting plants, blast heater having oppositely located boxes connected by pipes, removable covers for boxes opposite ends of pipes, heating chamber containing boxes and pipes, and means for forcing blast through heating channels.

APPARATUS FOR HOISTING OR LOWERING MATERIAL.—No. 720,329; J. F. Cook, Johannesburg, Transvaal, South Africa.



In hoisting device combination of hoisting engine, hoisting ropes, skips or cars attached to ropes, tail ropes attached to skips or cars, other skips or cars attached to tail ropes whereby tail rope attached to one car acts as hoisting rope for another car, and means to receive load of car at highest point and transfer same to a car of next series when at lowest point.

CRUSHING MILL.—No. 720,480; H. U. Prindle, Sacramento, Cal.



Combination with holder for containing material to be crushed, frame detachably supportable over holder, frame having pendent brackets, and deflector plate M supported on brackets; of central shaft H, horizontally disposed carrier B, rotatable with shaft H, shaft G, journaled in carrier B, yoke E rotatable with shaft G, crusher rolls mounted on yoke E for independent rotation, and gear mechanism for joining shafts H and G, and imparting planetary motion to shaft G with its support E.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence) —The town of Nome is at present quiet. Everybody is busy on winter diggings. Dry creek benches are being worked extensively; also benches off Poluk creek. The Snowflake mine on Dexter is doing well. Fourteen men are working, a steam hoist has been erected and the manager expects to have a "dump" out before spring worth \$100,000. The Sugar mine at Dexter is also doing good work. The Surprise mine on Anvil creek is putting down a hole, prospecting. The Daisy mine is working six men. Last year this mine produced \$40,000.

There is a stampede to the Kongrook and Inmat huk river, the latter of which has proven to carry extensive gold-bearing gravels. Steam thawers are being employed in prospecting the ground. A number of thawers are busy on the Marine benches off Hastings creek, 9 miles east of Nome, where good diggings were found late this fall. Ophir creek benches are being worked. Work on Lane's ditch is suspended because of the short days, but will be commenced early in April. All available men will find work in Council before navigation opens.

The town of Nome is healthy and growing. Provisions are moderately high, with the exception of coal at \$35 per ton and eggs at \$20 per case, ham at 20 cents per pound and bread at 10 cents per loaf. Nome, Nov. 26, 1902.

Two thousand miners are reported stampeding to Tanana from Nome, Dawson, Eagle and Rampart. U. S. Commissioner Claypool writes from Circle that 600 claims have been recorded in the new district, which is known as Fairbanks. Fifty three creeks have been staked.

T. H. Ellis, president and manager of the Yellow Jacket M. Co., on Windham bay, near Juneau, says they will double the capacity of their milling plant installed last season, and will handle 100 tons of ore per day.

ARIZONA.

COCHISE COUNTY.

The Bisbee, Arizona, G. & C. M. Co. has been organized to operate in the Warren mining district, northwest of Bisbee. M. D. Scribner, C. T. Clark, J. Schmidt, F. H. Bopp are the officers.

The Leadville M. Co. has incorporated to operate the consolidated Holmes, Fitch and Storebeck groups near Gleason. The officers are: W. Holmes, C. M. McKean, H. T. Fitch, W. A. Sorebeck and H. A. Morgan. The ores carry copper values.

GRAHAM COUNTY.

The Shannon Copper Co. is building a railroad from the Wiseman tunnel to the Antietam mine, near Metcalf. Their smelter will resume next week.

Superintendent Melder of the Home Copper Co., near Clifton, says they have opened a body of \$70 gold ore on one of the company's claims.

MARICOPA COUNTY.

Superintendent Franklin is building a road from the Wickenburg-Gilbert road, near Wickenburg, to the shaft on the Uncle Sam C. Co.'s mine, after which the shaft, down 100 feet, will be retimbered and a gasoline hoist installed and sinking continued to the 500-foot level.

MOHAVE COUNTY.

C. Hoffman of Enterprise, Kan., one of the owners of the Samoa and Fourth of March mines, near Chloride, has bought the Paymaster mine near Cerbat. Work will begin next week.

The Mohave G. M. Co. will build a 40-stamp mill, near Mellen, out from Kingman.

The Railroad mine, near the Gold Road mine near Kingman, has been sold to the Gold Road Co., A. Chapelle, manager, for \$10,000. The mine is the south extension of the Gold Road.

S. C. Bagg, general manager of the New Comstock mines, near Kingman, says machinery for development work will be put in at the Katherine mine of the group and a mill and reduction plant installed.

At Bull's Head canyon, 2 miles below the New Comstock mines, on the Colorado river, the Government is using a diamond drill boring holes into the river bed. The first 40 feet was through sand and gravel and the next 15 feet was in granite, that will make a secure foundation for the dam contemplated at that place. There are, approximately, 50,000 acres of land that can be brought under cultivation below the dam and above the Needles. It is reported electric power will be generated and sold to mining companies operating in that vicinity. All

the land to be benefited has been temporarily withdrawn from entry.

The Revonue M. Co., with mines near Ehrenburg, reports returns on a carload of ore shipped to the Selby Smelting Works, San Francisco, Cal.: Gold, 114 ounce per ton; silver, \$3.30 ounces per ton; copper, 32%.

Fourteen inches of ore is reported in the main tunnel on the back vein south at the Samoa mine. The ore carries shipping values in gold, silver and lead.

PINAL COUNTY.

Manager A. T. Colton drove a crosscut at the bottom of the Marion shaft last week to determine the width of the Marion vein, 30 feet below the surface, and shows the vein 18 feet wide, with a 3 foot pay streak of copper ore on the hanging wall. The mine is in the Red Hills, 12 miles east of Florence.

The Dragoon Con. M. & S. Co. at Pearce, in the Dragoon mountains, has its shaft down 100 feet. A gallow's-frame is being built and a 34 H. P. gasoline hoist will be installed. A millsite with water rights has been secured and a smelter is under consideration. There are twenty claims in the group.

It is reported at the Troy-Manhattan copper mine at Troy that a body of copper sulphide ore has been opened up, carrying good values in copper and gold. A sixty-ton smelter is turning out four tons of copper a day. The company has 1200 acres and is pushing development work at the Stinson, the Alice and Buckeye. Stopping ground has been opened in the Buckeye on high-grade ore. The management contemplate putting up a larger smelting plant within a few months.

YAVAPAI COUNTY.

(Special Correspondence) —Hot Number tunnel, in the Bradshaw mountains, owned and operated by the Copper Cobre M. Co., is in 900 feet. When completed it will be 2500 feet. It is 9 feet wide, 8 feet high, with double tracks. Progress, 225 feet monthly, using power drills. The power plant is $\frac{1}{4}$ of a mile from the tunnel. The Ironclad tunnel is in 500 feet, and will drive to 2500 feet. Veins occur in a zone 3000 feet wide. This company owns a strip 6 miles long and 314 miles wide. The ore carries copper, gold and silver. G. W. Middleton of Prescott is manager.

The French Lily mine is down to the 200 level and taking out shipping ore. They have a 20-foot vein.

Prescott, Feb. 11.

(Special Correspondence) —The Knickerbocker G. M. Co. of Prescott is working the Hidden Treasure mine, 4 miles from Turkey Creek station, on the P. & E. Ry.; four shafts on the property; cleaning and retimbering shafts. Drifts connect shafts Nos. 1 and 2 at the 50 and 90-foot levels. The drift from shaft No. 3 shows a body of good ore. Will sink shaft No. 1 to the 600 level and will put in a hoisting plant and 10-stamp mill. The water will be supplied from Dripping springs, 4 miles distant, to which a pipe line will be laid. The mine is in Black Canyon mining district. E. S. Campbell, of Prescott, is manager.

E. A. Franke, of Turkey Creek, is operating his 2 stamp mill on his property in Black Canyon district.

Turkey Creek, Feb. 11.

(Special Correspondence) —The Iron King mine, owned and operated by the American Copper Co., is about $\frac{1}{2}$ mile west of the smelter at Val Verde. They have twenty claims. The main working shaft is down 260 feet. The first level is at 133 feet. There is a drift running south 400 feet connecting with another shaft and a drift running north from the main shaft 400 feet. No. 2 is the main shaft. From shaft No. 1 there is a drift over 200 feet. There are three crosscuts on this vein about 300 feet apart. All the shafts, drifts and crosscuts are in ore. At present about fifty men are working. A 200-ton concentrating and cyanide plant is now being erected. The mill is being built by the Joshua Hendy Machine Works of San Francisco, Cal. They expect to have the mill in operation by March 20th. B. Blanchard is general manager.

Val Verde, Feb. 11.

(Special Correspondence) —At McCabe the Model G. M. Co. has ordered machinery for increasing the mill capacity, now ten stamps, and also for handling the dump at the mine and mill. The ore in the dump contains payable values. The main shaft is down 700 feet and will be sunk 200 feet farther. They have finished retimbering the shaft destroyed by fire between the third and fourth levels. There are several thousand feet of tunnel and drift work in the mine. Ore is shipped to the smelter at Val Verde. L. W. Felt is manager.

The Henrietta mines, six claim, was bought by the Braganza G. M. Co. a year ago. P. A. Johns, manager, has been developing the mine and repairing the

mill, which had been idle for a number of years. The tunnel is in 2000 feet, connecting with the main shaft, 300 feet deep. Levels connect shafts Nos. 1 and 2 at the 200 and 300 levels; 4000 feet of work has been done. They have several dwellings, an office, assay office, mill and boarding house, and are erecting others. The mine is on the McCabe side of the hill and the mill is at Big Bug. They are putting in a tramway from the tunnel to the mill. The ore has been packed on mules over the mountains. The company has been running ten stamps and is now putting in ten more. The railroad crosses the property. The water supply is pumped from a well in Big Bug creek, 800 feet distant from the mill. Sixty men are employed.

McCabe, Feb. 16.

C. T. George has bought a group of claims at Poland, in the Poland district, near Prescott, and made the first payment of \$16,000.

The number of men working at the smelter of the United Verde at Jerome is being increased. The 500, 600 and 700-foot levels are being opened up from the new shaft. Three of the small furnaces are in operation and a fourth ready to be blown in. The 500-ton furnace will be finished next week.

YUMA COUNTY.

At the Valenzuela group, near Quartzite, drifting has been started on the 216-foot level. The shaft has been sunk to that depth on the vein, with only one wall showing. No. 3 shaft will resume sinking.

The Harqua Hala M. & M. Co. of Philadelphia, Pa., men have bought the Mineral Belt group of claims near Yuma for \$150,000.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence) —On Sutter creek, beginning about $\frac{1}{2}$ mile above the town and extending for a mile or more up the stream, the bed of the creek has only partially been worked for gold. The past year extensive preparations have been making to recover the gold in the channel. A long drain ditch has been dug and a large number of men will be employed in sluicing this ground this spring. A mile above this place a second company is at work under direction of Superintendent Clough engaged in similar work.

The reports that the Ballou mine, near Sutter Creek, is about to resume operations is not true, no such move being contemplated at present.

The Oneida mine shaft has been sunk to the limit of the hoisting reel, without remodeling the same. There is abundant capacity in the engine, but the reel will not hold more rope without extending the arms which guide the flat rope to its position.

Sutter Creek, Feb. 18.

At the Zella mine, at Jackson, the shaft repairs are completed and operations will resume this week. The chlorination works have exhausted the supply of sulphurets on hand and are closed down temporarily, says Superintendent W. F. Detert.

The stoppage of the power plant at Electra resulted in a suspension of the mill and underground operations, except shaft work at the Oneida mine, near Jackson. This mill is entirely dependent on electric power. The shaft sinking will be finished next week.

F. Glanville of Drytown, with F. Cupp, sluiced out \$350 worth of gold in the hotel lot the last two months, says the Ledger. The nuggets found range from \$3 to \$9. Last week, on reaching bedrock, he struck a quartz vein 4 inches thick carrying free gold, which he will develop.

Owing to damages done the pipe line of the Standard Electric Co., above Electra, by the storm, several of the quartz mills have been idle in this county the past week. The Central Eureka mine, near Sutter Creek, is obtaining power temporarily from Marysville.

CALAVERAS COUNTY.

The twenty stamps at the Sultana mine, near Angels, are in operation, says Manager Morgan.

S. P. Smith will start work on the A. P. A. and Boston Consolidated mines, near Angels, and as soon as the weather will permit a 10 stamp mill will be erected.

It is reported at Angels that the Morgan mine on Carson hill, 5 miles south of Angels, is soon to be reopened under the direction of the heirs of J. G. Fair. The property, which has the reputation of being rich, has been in litigation for many years.

The Mountain King G. M. Co. has bought the Heinsdorff group, between San Domingo creek and Indian creek, near Murphys, including the Rose Rock mine.

The Carson Hill G. M. Co., near Irvine, has begun work on a 10-stamp mill, says W. Smith. Two shifts are at work in the 700-foot tunnel being run for the ore shoot.

The tunnel of the Jack Rabbit mine,

near Angels, in 425 feet, will be driven ahead 200 feet, says Superintendent F. Purinton.

At the Oriolo mine, near Angels, the 10-stamp mill is in operation and ten stamps more will be put in this spring, says Superintendent E. D. Griffith.

The Why Not quartz mine in Chili gulch, near the Quaker City mine, 3 miles southwest of Mokelumne Hill, has resumed operations under Superintendent J. E. King.

The Phillips gravel mine at Buckeye, owned by T. C. Peters of Mokelumne Hill, will be worked by a company, with W. T. Robinson, superintendent, says the Chronicle.

The gravel mines of Sloan & Rudoff Bros., at Balaklava Hill, near Vallecito, are under bond to A. Lunberg for two years for \$15,000.

EL DORADO COUNTY.

W. A. Witherspoon of Colorado and D. Boscut of Placerville have bonded the Gray mine, near Shingle Springs.

The Montezuma M. Co. at Nashville has put in a new double hoist. The machinery was removed from the Mutual mine, near Sutter Creek, in Amador county.

KERN COUNTY.

W. S. Morton, president of the Potomac Oil Co., in Kern River field, near Bakersfield, will drill two additional wells. There are eight wells on the lease and the company has, with its Summerland and Los Angeles product, a daily output of 500 barrels — The Monarch Oil Co., near Bakersfield, and its lessees, will put down ten new wells.

The Union Oil Co. is putting down twelve additional wells on the Claremont lease in the Kern River district, near Bakersfield.

The Sedala & California well, No. 5, at Sunset, is producing 600 barrels a day, according to reservoir measurement, says the Californian.

Well No. 1 of the Twenty Oil Co., near Bakersfield, was started pumping last week. The casing in No. 2 has been perforated.

The Belgium Oil Co. at McKittrick is pumping two wells which are yielding 300 barrels a day. The company has sold its output to the extent of 25,000 barrels and more wells will be drilled. The company has its own pipe line, 3 miles in length, and sixty acres of land.

A. S. Munson of Colorado Springs, Colo., secretary and treasurer of the Federal Crude Oil Co. and the Sunset Asphalt Refining Co., says work will begin by March 1 on their refinery to be built at Sunset to handle the product of the Federal Co., which is a consolidation of the Colorado-California Fuel Oil Co. and the Wichita Oil Co.

The Exposed Treasure M. Co., near Mojave, P. Humbert Jr. manager, is operating a 20-stamp mill. Water is supplied through a 15-mile pipe line.

MONTEREY COUNTY.

President Brophy of the Combined Oil Land Co., says they are drilling a 14 inch well on their ground, 6 miles south of San Lucas.

NEVADA COUNTY.

(Special Correspondence) —It is reported that the Idaho-Maryland mine, near Grass Valley, is to be reopened by a Boston company, who will begin unwatering the mine. It has been closed down since 1901. The mine has been worked to a depth of over 2000 feet on the ore shoot, which extends through three mines, beginning at the surface in the Eureka and dipping downward through the Idaho into the Maryland. Crosscuts run in the bottom levels indicate that there are parallel ore shoots in the foot wall. The mine is equipped with large hoisting works, 40 stamp mill, compressors, etc. It is stated that the ore shoot has produced in the three mines \$25,000,000 in gold. The new company will be known as the Idaho-Maryland Development Co., with its office at 101 Milk street, Boston. The officers are T. W. Shapleigh, E. M. Preston, G. E. Marvin, H. P. Colson, C. B. Lakenan, at present superintendent of the Coe mine, near Grass Valley, will be superintendent of the new company. The company will enlarge the works and will install modern machinery.

ORANGE COUNTY.

The Fullerton Tribune says thirty-four new wells are being drilled in the Fullerton field and three rigs are in course of construction.

W. B. McPherson, superintendent the Santa Ana tin mines, in Trabuco canyon, 30 miles southeast of Santa Ana and 15 east of El Toro, on the Santa Fe railroad, says the mill will be increased to fifty stamps and other machinery installed. J. A. Comer of Los Angeles is manager.

SACRAMENTO COUNTY.

Superintendent L. Wing is putting in

machinery at the mine of the Sacramento & Rescue M. Co. at Blue ravine.

SANTA CLARA COUNTY.

Manager R. B. Harper of the Santa Teresa Q. M. Co., operating the Santa Teresa quicksilver mines, 10 miles southwest of San Jose, says development work will be increased and a furnace with 30-ton daily capacity built. A second furnace will be erected later in the year. Men are driving new tunnels and cutting a road from the mine to the main county road.

SHASTA COUNTY.

The resumption of work at the Keswick smelter has caused a renewal of operations in the mines east of the river. At the Central mine, in Old Diggings district, the number of men at work has been increased to twenty-five. The shipment of ore to the smelter begins this week. The railway from the mine to Central spur has been repaired, the ore from the spur being sent across the river by an aerial tram and dumped at the smelter. The Texas mine has taken on more men and shipments of ore to the Keswick smelter begun. Other smaller properties will resume shipments.

The J. J. Chambers Co. of Redding has bonded the Mabel, Emma and Vulcan group of mines on Mule mountain. The Free Press says the property will be taken up by the Great Divide Gold Co. Work will begin next week on the stamp mill for the Great Divide and will be set up on Clear creek, convenient to all the mines of the group, including the Gold Dollar and Cardiff.

SIERRA COUNTY.

The Sierra Butte mine, near Sierra City, has resumed operations and the forty men who went on strike have gone back to work.

SONOMA COUNTY.

The Healdsburg Quicksilver M. Co. has incorporated; directors, G. H. McCullen, J. C. Hobson, F. A. Cruse, C. D. Evans, W. B. Whitney, J. Wilson and W. B. Kruse of Healdsburg. The company will operate in northern Sonoma county.

TRINITY COUNTY.

G. H. Gill, having a bond on the Yellowstone mine, on the east fork of the north fork of Trinity river, near Coleridge, will reopen the mine. There are 2000 feet of underground work on two of the claims, showing a 5 foot rim. The mine is equipped with a 10-stamp mill and 800-foot tramway.

TUOLUMNE COUNTY.

J. P. E. Heintz of San Francisco has bought the Leland ranch pocket mines on Nigger hill, near Jamestown, and will begin development.

The Harvard mill, near Jamestown, is dropping forty stamps, says Superintendent Gorrie. The 20-drill air compressor is in operation, the underground connections being completed. The use of No. 2 shaft for hoisting purposes is discontinued. A station pump is being put in on the 700 level.

The App shaft, near Jamestown, says Superintendent W. L. Turner, will be sunk 200 feet below the eleventh station. W. A. Nevills, the owner, says he will install a cyanide plant in Quartz, as 300 tons of sulphurets per month are being treated at the two chlorination plants at the Rawhide.

Work will soon begin on the power plant projected by Sidney Sprout, E. E., of San Francisco, Cal., and others on the Tuolumne river. It is estimated 2000 H. P. will be generated.

At the Mt. Jefferson mine at Groveland an overhauling of the mill is in progress, says Superintendent J. H. Gilmore. New foundations, mortar blocks, etc., will be put in.

The New Era says the Superior Court has given judgment for J. E. Conde of Carters against the Dreisam G. M. & M. Co. on the foreclosure suit of the Dreisam gold mine, above Carters. The judgment was for \$9000.

Articles of incorporation of the Mount Jefferson Mines, Con., have been filed. The company was formed under Arizona laws, with Phoenix as headquarters. The mines are near Groveland. J. M. Melghan, C. H. Hilbert, C. F. Humphrey and B. Goodwin are directors, and J. H. Gilmore superintendent.

The double compartment shaft of the Sierra, near Groveland, is down 110 feet. The tunnel has cut the vein at a depth of 70 feet, and drifting has developed 10 feet of ore assaying \$39.

At the Spring Gulch or Marshall mine, south of Carters, in a drift from the 700-foot level a vein has been cut that crosses the Spring Gulch vein. It is 2 feet wide and shows free gold. The mill will resume next week.

The Providence mine, near Carters, has resumed after repairing the hoist. Drifts are being run on the 1000-foot level.

At the Soulsby mine, at Soulsbyville,

they are sinking a winze on the 200 level on the shoot, and running the 300 level to connect with this winze. The vein is 12 inches wide and shows free gold. The mill is running one shift, ten stamps, says Superintendent W. Sharwood.

At the Mountain Belle the water power hoist is in operation, with 200 feet pressure from the ditch, which carries the water to the Soulsby and Black Oak mines. At the 100 level drifts are being run.

COLORADO.

A report from Denver says the State of Colorado has begun quo warranto proceedings against the American S. & R. Co. for the annulment of its charter and to prevent its further operating in that State unless it pays its taxes. This action, it is said, will test the validity of the flat tax law.

ARAPAHOE COUNTY.

A \$15,000,000 steel plant will be one of the results of the building of the Moffat road to Routt county and Salt Lake City. The Frontier Coal & Steel Co. has incorporated—D. H. Moffat, C. J. Hughes Jr. and W. G. Evans—and will build steel works near Denver. "We have 20,000 acres of land from which a site may be selected, convenient to the city and near the line of the new road," says D. H. Moffat.

BOULDER COUNTY.

The Wisconsin Oil Co., subleasing from the Boulder Oil Co., has opened a flow of oil at a depth of 2060 feet in its new well at Boulder.

The Longfellow mine at Jamestown has been sold to the New Century M. & M. Co., of which R. G. Munn is manager, for \$200,000. The mine has free gold and telluride ores.

The Copper Ranch at Sunset is developing its properties, comprising 170 acres. The main development is on the Kate vein, where a shaft is sunk on the vein at a dip of 30° from the vertical. It is 217 feet deep. The vein varies from 8 inches to 3 feet in width. Through this occurs a pay streak of heavy sulphide varying in width from 4 inches to 1 foot. Samples show values of \$8.70 to \$61.20 per ton in gold.

Eubanks, Jump et al., operating claims in Long's gulch, have opened up several veins of low-grade ore, some of them being 10 feet in width. The claims are so situated that a crosscut tunnel will open all five of the claims at good depth. The crosscut tunnel, which has its portal on the White Star vein, has been driven 125 feet.

Fifteen men are leasing on the Big Five mine at Francis and they expect to ship five cars weekly to the Wall Street mill. They have built a side track from the Big Five switch to the tunnel so that cars can be beloaded at the mouth of the tunnel directly from the tram car.

Manager H. B. Neff at the Valley Forge mine, above Salina, has the ore bins full awaiting shipment of three cars of low-grade ore to the Wall Street mill. Work has begun on a new slope 300 feet from the face of the tunnel.

R. Wiggers of Gold Hill, operating the Small Hope group in Wilson gulch, has opened up a body of low-grade ore. The property is a tunnel proposition and has been developed for 250 feet. The ore runs from \$15 to \$18 per ton and he has made one shipment of forty tons to Wall Street.

CHAFFEE COUNTY.

A bond and lease on the Gold Bub mine, near Turret, has been given to the Gold Pan M. Co. of Victor, and development work will begin next week.

The Gold Bug mine, at Turret, has been bonded and leased by the Gold Far M. Co., operating at Victor, Colo., and Mercur, Utah.

CLEAR CREEK COUNTY.

Superintendent M. Tong of the Aliunde mine, on Leavenworth mountain, near Georgetown, says 17,900 ounces of silver was the product of three men's work during a part of January. The ore was taken from the Haggart lease on the 1000-foot level.

E. W. Williams of Denver, operating the Specie Payment mine at Idaho Springs, says drifting is under way on both sides of the shaft, and a new ore body found on the west side showing smelting and milling ore. The mill bought by this company will be rebuilt.

The Shafter mine, near Idaho Springs, is arranging to lease the Allen mill, says Manager Roller. Drifts extended at the fifth and seventh levels have opened 5 feet of concentrating ore, and raises are being driven connecting the lower levels.

There are forty sets of leasers working in the Franklin mine, near Idaho Springs, on ore bodies opened up by the Franklin Co., which is consolidated with the Freighter's Friend.

G. B. Holden of Boston, Mass., managing director of the Silver Mountain M.

Co., at Empire, says the mine will be reopened and the mill put in operation.

It is reported the Stanley mine, owned by the Stanley Con. M. Co., near Idaho Springs, has been sold to A. D. Bulls at sheriff's sale on a judgment of \$34,000.

CUSTER COUNTY.

W. B. Jackson, operating the Webster group of mines, near Silver Plume, says a 500-ton chlorination plant will be installed.

DOLORES COUNTY.

The Mt. Gorum M. & M. Co., at Dunton, is crushing twenty-five tons of ore per day in its 10-stamp mill, producing one ton of concentrates. A carload of concentrates was shipped to the smelter this week. The company has thirty-seven men at work. The tunnel is in 600 feet, and 500 feet of it is stopping ground. The values are principally in gold.

EL PASO COUNTY.

At Colorado City 150 members of the Mill and Smelterman's Union, employed in the Standard smelter of the United States R. & R. Co., are reported to be out on a strike, due to a question of wages.

FREMONT COUNTY.

The Canon City smelter of the United States R. & R. Co., south of Canon City, is to be further enlarged this spring, the recent increase in capacity proving inadequate, says the Denver Times.

The factory of the Colorado Portland Cement Co., 6 miles east of Florence, is closed indefinitely, says Superintendent A. Moore, as the larger plant of the company can readily supply the 300,000 barrels of cement, the estimated annual consumption of Colorado.

GILPIN COUNTY.

Manager B. W. Myers reports an 8-foot body of ore struck on the Hall ranch property of the Fostoria G. M. Co., operating in Pleasant Valley district, southeast of Central City. The strike was made in the Summit shaft at a depth of 127 feet, and shows milling ore.

The shipments from Gilpin county for January show an increase in the shipment of ore and concentrates from Black Hawk. During the month 367 cars of ore (7340 tons), were shipped, an increase of 50 cars over January, 1902.

At the Running Lode mine, below Black Hawk, operated by the Gower Mine Syndicate, Limited, of London, England, they are taking out 450 tons of ore per month, which is netting \$7000.

On Michigan Mountain, near Apex, the Cow Boy group, owned by the Stuart, Murray & King Co. of Denver, is being developed. A tunnel following the vein is being driven from Silver creek to cut the old workings at greater depth.

Boston men have an option on the Two-Forty mine, near Russell Gulch, and are forming a company to operate the same. Machinery will be installed and development carried out through the 80-foot shaft near the upper tunnel working, but which will be sunk several hundred feet.

A local company has taken a lease on the I. X. L. claim on Pewabic mountain, near Central City, and is erecting a small shaft building for temporary purposes. The shaft is down 100 feet, showing smelting ore.

For the first week in February the ore shipments and tailings sent from the Black Hawk depot were seventy-one cars, or 1420 tons. On account of a shutdown at the Golden smelter for two weeks, the shipments for this month can hardly be expected to show their customary increase.

The Russell Gulch M. & D. Co., in which Idaho Springs men are interested, has decided to install machinery on the Rocky Mountain Terror, near Russell gulch, on which it has a lease and option, and expects to begin development next month.

GUNNISON COUNTY.

The Gold Pick group, near Vulcan, is being operated by the Gold Pick M. Co., recently incorporated by local and Nebraska men. On the Arabella at Vulcan at 100 feet the operators are opening up a vein of copper ore, some of which has been stooped out.

The Headlight M. Co. at Spencer last week installed a pumping plant on its shaft. The shaft is down 125 feet and will continue sinking before running a level. The mine is owned by the Christian Moerlein B. Co. of Cincinnati, Ohio.

In the Dandy mine, near Spencer, owned by F. Holt of Spencer, with D. F. Strouse and J. T. Phillips of Gunnison, while working in the 50-foot level last week, the operators cut 5 feet of ore and drifted on same, which runs \$15 in gold per ton. In the bottom of the shaft a shoot streak of ore is showing, which carries tellurides.

HINSDALE COUNTY.

T. C. Malone of Paterson, N. J., will reopen the Union Pacific mine in Alpine gulch, near Lake City.

H. F. Wells, secretary of the Henson

Creek Lead M. Co., says they have closed down their mines near Lake City until spring.

LAKE COUNTY.

Manager Newell the Fryer Hill Mines Co., at Leadville, says the Pride of the West shaft will be sunk 400 feet, at which depth it is expected the Cady ore body will be cut. The Yak tunnel, near Leadville, is within 150 feet of the Ibox No. 4 shaft, the line of which it will cut at 200 feet below the bottom, and a drill hole is being sunk so that the shaft may be sunk to the tunnel level without trouble from water. The sulphide mill of the Arkansas Valley smelter is expected to be in operation by Feb. 24. It will have a capacity of 300 tons a day. The Bon Air, near Leadville, has increased its shipments of iron to fifty tons per day.

Director H. R. Morris of New Milford, Pa., and Manager J. Guth, are examining the Banker mine, near Leadville, with the intention of installing a reduction plant to handle their low-grade ore.

The Midas M. Co. at Leadville has bought the mines and equipment of the Coronado and Phoenix companies in the oxidized iron belt of Leadville basin. They now control the Midas, Coronado, Sixth Street and New Northern groups.

The last named gives them iron-silver bearing ground, extending beyond Ninth street into Poverty flat. The central pump station for the present will be the Coronado shaft, which is 650 feet deep. The shaft will be drained, a station cut, and 600-foot drift run to connect with the Midas shaft 110 feet below its bottom. A drift of 600 feet will connect the 650-foot level of the Coronado with the Sixth Street. Superintendent D. Jones expects to have these connections made by May 1. In the meantime shipments will continue from the Midas and Phoenix upper levels. S. D. Nicholson is manager.

The Yak tunnel near Leadville is within 150 feet of the Ibox No. 4 shaft. It is not intended that the tunnel shall cut directly beneath the shaft, but 30 feet distant, and a crosscut will be driven, when the 4-inch drill hole now going down from the No. 4 will be cut, says Engineer H. Platt. The Best Friend tunnel is in 250 feet, and by April 1st it is expected to get under the old shaft where the vein should be cut.

LARIMER COUNTY.

The Pearl C. M. & S. Co. was incorporated last week to operate near Pearl. W. L. Culbertson, W. A. McLogan, C. Mark, R. E. Coburn and P. B. Coolidge.

LAS ANIMAS COUNTY.

The Northern Coal & Coke Co. is opening up a mine in Timber canyon, a few miles north of Trinidad, with G. Fruth as superintendent.

Development work is being done in the Green Canon mine, near Aguilar, with J. R. Bond as superintendent.

MINERAL COUNTY.

The Humphreys mill, near Amethyst, will be started up next week, says Manager Fitzgerald.

OURAY COUNTY.

A strike is reported in the Newsboy mine, near Ouray, owned by the Newsboy Co. of Colorado Springs, showing a body of high-grade ore uncovered near the breast of the 1600-foot tunnel. Shipments will be made to the Denver smelters, while the second grade is being stored to await the erection of a company mill, which will go up this spring.

The Treasury tunnel at Red Mountain, near Ouray, closed down last week. The tunnel is in 4000 feet. Manager W. J. Hammond, Jr., says the company has been having litigation in its efforts to get a right of way, and many attempts have been made to stop the driving of the tunnel by injunction.

PARK COUNTY.

The Badger Mountain M. & M. Co. has been incorporated at Colorado Springs to operate a group of six claims in the Badger Mountain mining district. M. L. & J. H. Crasper, H. J. Newman, G. O. Beal and W. G. Newman are the officers.

PITKIN COUNTY.

Men are at work overhauling the Mollie A. mill, near Aspen, to handle the ore from the Newman tunnel dump. The railroad will build a switch to the dump. It is estimated that there are 30,000 tons of ore in the dump, which will net the mine \$3 a ton profit.

SAN JUAN COUNTY.

In the quarterly report of the Kendrick & Gelder S. Co., Superintendent Umbell of the Henrietta mine, near Silverton, says 2000 feet of work have been completed on No. 7 level, 600 feet on the vein. No. 10 level is being driven to cut the Orloff, Surprise and Henrietta veins 300 feet deeper. E. W. Walter, superintendent of the smelter, says a profit is made from

the fractional quantities of gold (less than \$1 in gold per ton not being paid for), and from the fact that the loss in smelting silver does not equal the percentage deducted on that account. The shipments for the season show that 9.9 tons of crude ore is concentrated into one ton of matte.

SAN MIGUEL COUNTY.

F. J. Hobbs of the Butterfly mine at Ophir, says in the lower tunnel the Ida ore shoot has been opened up for 300 feet, showing a continuous ore body. There are 2 feet of milling ore exposed in the breast of the workings. The Butterfly-Terrible Co. is operating fifteen stamps.

TELLER COUNTY.

Repairs are being made on the St. Patrick shaft house which was partially destroyed by fire last week. The extent of the damage done amounted to \$1000.

The weekly statement on shipments from Stratton's Independence mine at Cripple Creek, issued from the London office, shows the following output for the third week in January: Jan. 17, 255 tons, £950; 18, 255, £950; 19, 230, £800; 20, 230, £800; 21, 260, £950; 22, 240, £600; 23, 215, £700.

Manager S. Bell says sinking will be resumed on the Hull City placer, near Cripple Creek, by the Cripple Creek M. Co., operating the ground under lease. The shaft is down 1150 feet. It is expected the total production for February will reach 2000 tons of an average grade of \$35.

The directors of the Mary Nevins Co. last week granted a lease on the north end of the Nevins & Hibernia group, near Cripple Creek, to Cree, Bowers & Lewis, of Colorado Springs. The shaft will be sunk to 300 feet. The remainder of the property will be leased.

Operations have been resumed by the Lansing Leasing Co. on the Pinnacle mine, on the north slope of Bull hill, Cripple Creek.

Operations are resumed on the Pauper mine at Cripple Creek by Practical G. M. & L. Co. J. A. McIlwee is superintendent.

Nesbitt & Miller are installing a cyanide mill on Bull hill, Cripple Creek, to treat the dump of the Pharmacist mine, and expect to begin operations this week.

The directors of the Forepaugh G. M. Co. have granted a lease on the north 400 feet of their ground on Squaw mountain, adjoining the Alhambra, near Cripple Creek, to Dray & Co. for two years at 20% royalties.

Thirty feet a day are being made in driving the El Paso drainage tunnel, Cripple Creek, as follows: Ten feet a day from the portal, 10 feet south from the El Paso shaft at 600 feet, and 5 feet each way from the intermediate shaft in Aequa gulch. It is 960 feet from the portal to the first working shaft, and 300 feet of this has been driven. The bulk of the work lies between the El Paso shaft and the second or deeper working shaft which is being sunk on the Republic ground at the rate of 5 feet a day.

Lessee Hummer, operating through the Sweet shaft of the Gold Bond Co. on Gold hill, Cripple Creek district, is shipping 100 tons of ore per month that averages \$40 per ton in gold.

Manager De la Vergne of the Isabella mine, at Cripple Creek, says new shoots have been opened in the ninth, tenth and eleventh levels. This vein has been found east of the Buena Vista, and in the ninth has been proven for 100 feet. The screenings run two ounces gold. In the tenth and eleventh levels another vein has been found, which gives values of \$25.

The Valley City Leasing Co., holding a bond on the Shurtliff No. 2, Cripple Creek, ceased sinking and have begun cutting a station at the 900-foot level. Shipments from the upper levels will be resumed.

H. F. Hossman of Cripple Creek has a one year's lease on a block of the Trail mine below the lower tunnel level, and begun development work.

E. M. Crockerly, who has been leasing on the Gold Dollar dump, has had his lease renewed and will put in machinery to handle the waste rock on a larger scale.

F. Duncan of Cameron has bought an interest in the Robertson Bros. lease on the Flying Cloud, near Cripple Creek, and more men will be put to work.

G. F. Fry, manager of one of the Cripple Creek samplers, says there isn't a sampler in the district that is not receiving as much ore as it can handle. When the drainage tunnel is completed such mines as the Mary McKinney, Anaconda, Elkton, El Paso, Doctor-Jack Pot and others will be able to ship double the quantity of ore they are now sending out.

IDAHO.

BOISE COUNTY.

The Edna mine, 22 miles from Idaho City, has closed down until March 15, owing to the heavy snow.

IDAHO COUNTY.

The mill of the Gold Coin M. Co., Black Lake district, near Weiser, is in operation. W. H. Davis is superintendent.

The Homes'ake and Idaho groups, near Thunder, of seventeen claims on Beaver creek, adjoining the Wordenhoff mines, have been sold to H. L. Hollister of Chicago, for \$125,000.

The 5-stamp mill of the Galena Creek G. M. & M. Co., near the American Eagle group, near Elk City, is in operation, says Manager J. D. Boyer.

P. R. Hogan of West Superior, Wis., part owner of the Hogan mines at the Grande, on Crooked river, near Elk City, says more stamps will be added to their mill in the spring.

The American Eagle M. Co., operating near Elk City, has received \$7544.22, as the result of the first month's run on 600 tons of ore. In addition five tons of concentrates were produced which assay \$105. The mine is running twenty tons of ore a day and working twenty men, says C. K. Merriam, one of the owners. A water wheel will be put in to supply power for both mine and mill. There will be a 90-foot head by putting in a 2800-foot pipe.

The government assay office returns showed one bar, \$3092.99 gold and \$16.27 silver, net; a second, \$964.09 gold and \$5.74 silver; and a third, \$3477.49 gold and \$19.20 silver.

LEMHI COUNTY.

On Indian creek near Gibbonsville, the Kittle Burton M. Co., controlled by Michigan men, has fifteen stamps dropping on ores from the Ulysses mines. After a ton days' run they cleaned up last week 149 ounces of gold valued at \$3000. H. C. Edwards, manager, says an aerial tramway between the Ulysses mines and the mill is being built. The vein is 10 feet wide, of \$25 rock.

It is reported cobalt and nickel have been discovered in the copper deposits in Whitebird district, to the extent of 5% of each of these metals. The copper deposits of this district are low grade, but the nickel and cobalt discoveries will result in their development.

OWYHEE COUNTY.

The G. W. Palmer & J. Holland group of seven claims on Florida mountain and east of the Trade Dollar mine, near Silver City, recently sold to Salt Lake parties, is to be developed under the management of A. L. Stevens, superintendent of the Addie mine.

SHOSHONE COUNTY.

R. Wilson & W. McKay of Wallace, part owners of the Mammoth mine, have bonded the Alice silver-lead mine on Ruddy gulch, between Wallace and Mulan. The ores of the Alice will be handled at the Mammoth mill. About 2000 feet of tunneling has been done in the mine, with one shaft down 65 feet.

The Wild Rose, near Pierce City, owned by R. N. J. L. and A. J. Dunn of Wallace, is reported to have produced \$30,000 with a 2 stamp mill. It was discovered eighteen months ago. Manager J. L. Dunn says it is planned to run a 300-foot crosscut near the 110-foot level, and later run a 1000-foot crosscut to reach a depth of 400 feet.

INDIANA.

The Oil Men's Association of Indiana have asked the Legislature for an appropriation of \$50,000 to be expended in deep tests in various parts of the Indiana oil fields, in order to find a new supply of oil below the Trenton limestone, which is gradually becoming exhausted. There is still a large area of untested territory.

MADISON COUNTY.

The Consumers' Gas Trust Co. of Toledo, O., have let a drilling contract to Decker Bros. of Alexandria, which calls for 600 wells. Derricks are already up for 100 of the wells between Marion and Alexandria and ten are drilling. Five more will start drilling next week.

MICHIGAN.

HOUGHTON COUNTY.

The Franklin mine, near Houghton, is producing at the rate of 400 tons of mineral per month, equivalent to 5,000,000 pounds of ingot copper yearly. The sinking of the second shaft on the conglomerate lode at the Franklin Junior mine has begun.

Work is being rushed on the new Calumet & Hecla mill at Houghton. Two heads are running and two more will drop in March. The final two will stamp by May 1. The electric power plant will be ready by the time the six heads are in operation.

It is reported some changes are to be made in equipment at the Red Jacket shaft of the Calumet and Hecla. The hoisting arrangement is not capable of

performing the service expected from it when the machinery was installed; the power is ample, as the engines are capable of hoisting a 10-ton load at the rate of 3600 feet per minute. Allowing for reduced speed at the top and bottom of the shaft, the round trip can be made in five minutes. But at present the maximum hoisting capacity of four compartments does not exceed 1200 tons daily, working twenty hours.

It is reported from Houghton that the Winona will start a new shaft, to be known as No. 3, and will be 1650 feet south of No. 2. During January the mine shipped 5000 tons of rock.

The management of the Michigan mine near Houghton has decided not to erect a steel or iron shafthouse, but use Oregon fir instead. Work on A and B shaft houses has begun.

ONTONAGON COUNTY.

St. Louis men have taken an option on the Norwich mine, near Ontonagon. The Hamilton mine, adjoining, is being explored by the Copper Crown M. Co., also of St. Louis.

MONTANA.

BEAVERHEAD COUNTY.

Petroleum is reported 12 miles south of Dillon. The surface indications are said to be favorable, but no wells have been drilled as yet.

The Tombstone M. Co., owning a group of claims in the Vipond district, near Dillon, propose to install a 10-stamp mill.

N. W. Pierson of Anaconda has taken a lease and bond on the Mayflower mine in the Big Hole district, near Wisdom, for \$20,000.

Morse & Noyes are shipping ore from their Ajax mine near Wisdom, on the upper Big Hole, to the East Helena smelter, the ore being too base to be handled at a profit in the Ajax mill.

FERGUS COUNTY.

The cleanup of the Barnes-King mill, near Kendall, during the last fifteen days of January was \$20,000. It is the intention of the owners to double the capacity of the mill within the next year.

Manager E. H. Crabtree of the Case-Wilson Cyanide D. Co., has bonded the Gilt Edge Charlie, Emma K. and Quebec claims, between Whiskey Gulch and the Gold Reef mines, near Lewiston, for \$15,000. About 200 feet of work has been done and samples assayed \$6 on ore that can be cyanided.

Manager R. K. Neill, the Kendall mine, near Lewiston, says the cost for mining the ore and extracting the bullion (by cyanide) is \$1 a ton, not including development. They are handling 7500 tons a month through a 250-ton mill. The ore shoot has been tested to a depth of 250 feet, and is 100 feet wide by 700 feet long. Neill has eighty men at work and expects the mill will be doubled in size this summer.

LEWIS AND CLARKE COUNTY.

The Gloster M. Co. mines, near Marysville, have been bought by the Longmaid Brothers of Helena. The lead has been developed to a depth of 800 feet. It is intended to operate the mill and put in cyanide tanks to extract the gold from the tailings, which formerly went down the creek. Activity in Marysville district is increasing. Development work is being pushed on Bald Butte hill under the management of C. Couch.

On the Gold Messenger, near Marysville, the tunnel is being driven to strike the lead at a depth of 300 feet. At 100 feet on the strike of the lead there are 16 feet of milling ore which carries gold values. The company will erect a 50-stamp mill to take the place of the mill destroyed last fall.

MADISON COUNTY.

Superintendent J. Smith of the Watseca M. Co. at Rochester has 100 men at work in the Watseca mine. Last week a body of \$60 gold ore was opened up on the 400-foot level. The additions to the mill and concentrator are expected to be in operation March 1, says Manager C. Hand.

PARK COUNTY.

The Bear Gulch G. M. Co. has bought a group of twenty lode claims and the Highland and David Harum placers, near Ardine.

The Bear Gulch M. Co. mines, near Irvington, are reported sold to the Kimberly-Montana G. M. Co.

NEVADA.

ELKO COUNTY.

E. O. Lee, of Salt Lake City, Utah, managing director the Dexter mine at Tuscarora, says the mine and mill are closed down indefinitely.

EUREKA COUNTY.

W. H. Tibbals has a bond and lease on

the Lincoln group of fourteen claims, near Diamond, for \$60,000. The ores carry values in gold, silver, copper and lead.

The Lincoln group of fourteen claims, near Eureka, has been bonded by W. H. Tibbals of Salt Lake City, Utah, for \$60,000. The ledges carry silver, gold, copper and lead, and development will begin this month.

HUMBOLDT COUNTY.

The dry concentrator at the Sheba mine, in Star Canyon district, is being overhauled and will hereafter employ the wet process, says President Barton of Salt Lake City, Utah. An air compressor and drills are being installed.

LINCOLN COUNTY.

The Southern Nevada mill, near Searchlight, has resumed after a shut down of seven weeks for alterations. A 28 H. P. crude oil engine was put in. The company will erect in Manvel, San Bernardino county, Cal., an 11,000-gallon storage tank for oil. The main shaft on the Blossom is down 375 feet; drifts are being run at 330 feet. An electric plant is being installed to furnish power for the pumps and for lighting.

LYON COUNTY.

Superintendent H. Smolt of Butte, Mont., has resumed work on the Blue-stone mines, near Yerington.

NYE COUNTY.

J. W. Langley and M. L. Effinger of Salt Lake City, Utah, have bought the T. J. Breen & Co. group of fifteen claims in Ray district, near Butler, for \$50,000.

Sinclair, O'Brien, Stewart and Lee, owning a group of claims 8 miles north of Pictolus, near Butler, have organized the Sierra Vista G. M. Co.

President J. W. Harris of the Rescue M. Co., at Butler, says a 25 H. P. steam hoist, with boiler, a corrugated iron shaft house and a 30-foot gallows-frame, will be put up on their group.

STOREY COUNTY.

H. Zadig says the drill is down 819 feet in the Brunswick in porphyry and quartz, and that it is certain the Chollar and Potosi never reached the east ledge in working through shaft No. 1. He considers the situation important enough to warrant resuming work through shaft No. 1 on the Brunswick.

The cost of power, as furnished by the Truckee River General Electric Co. to the mines on the Comstock Lode, is \$7 per horse power per month, based on continuous service. The saving is over 60 per cent, as steam costs \$21 per horse power per month, says the Record.

WHITE PINE COUNTY.

In the Glasgow & Western Co.'s mine at Cherry Creek last week the cable broke and the cage dropped 400 feet in the main shaft. C. Karbstein, who was on the stage, had his legs and several ribs broken.

NEW MEXICO.

COLFAX COUNTY.

A flow of gas was struck last week in the oil well being drilled at Raton at a depth of 130 feet. The volume of gas is increasing, the well now being down 600 feet, with globules of oil appearing on the surface of the water.

GRANT COUNTY.

Machinery for the Burro Mountain leaching plant in the Burros, near Silver City, has arrived on the ground, says Manager L. P. Deming, and work will begin next week.

TAOS COUNTY.

The management of the American Con. Mines Co. of Colorado Springs, Colo., operating in the Rio Hondo district, near Taos, is negotiating for another group of claims near its other property, which will give them a total of 200 acres.

OREGON.

BAKER COUNTY.

The Snow Creek group of mines in the Greenhorns, near Sumpter, has been bought by the Oregon Mines Exploration Co. F. D. Smith of Sumpter is general manager and is developing the group by a tunnel, which cut the vein at a point giving 225 feet of backs. A raise is being made from the tunnel for the shaft and drifts run under the old workings.

Eames, Simmons & Cooper, owners of the Morning mine in the Greenhorn district, near Sumpter, propose to build a mill this summer. They have been testing their ore in the Psyche mill.

Manager J. F. Meikle of the Black Eagle mine, near Sumpter, says with the 20-stamp mill running he is mining and milling the ore for 90 cents per ton, seven tons per stamp being crushed, the ore being soft.

F. O. Bucknum has bought the Copper

Butte claim, the extension of the Iron Dike, near Sumpter. Assays on the Copper Butte show \$3 gold and 6% copper, and the vein is 10 feet wide.

Superintendent T. J. Sheedy started work on the Black Jack group, near Sumpter, this week. For the present work will be principally on the Osceola, where a 150-foot tunnel has been driven.

Operations will be resumed at the Basely Elkhorn mine, near Baker City, bought recently by F. P. Hayes, president of the Beaver M. Co. A tunnel will be driven 6000 feet. All the available water rights have been secured and the whole property will be operated by electric power.

The triple-compartment shaft on the Bonanza mine at Geiser is down 1000 feet and being sunk at the rate of 2 feet 10 inches per day, says the Sumpter Miner.

Thirty stamps are dropping at the Bonanza mine, near Sumpter, on milling ore, and the other ten will be in operation by March 1st. The drift from the 800-foot level crosscut has been extended on the vein. The shaft is down 975 feet, and is expected to reach the 1000-foot point by March 1st.

The Risk tunnel, on the Sampson group, near Sumpter, is in 325 feet, says Manager F. S. Lack, and the ore shoot shows 12 inches wide, assaying \$12.

On the Porcupine group, near Sumpter, owned by the North American G. M. Co. of Seattle, Wash., a plant of development machinery will be installed, says Superintendent J. W. Doyle.

The Cougar mine in Granite district, near Sumpter, has been sold to the Hendryx-Geiser Investment Co. of Baker City for \$500,000. The property is equipped with a roller mill, roasters and cyanide plant, capacity 250 tons per day. The ore runs \$8 per ton gold.

DOUGLAS COUNTY.

Superintendent Matthews says at a meeting of the Oregon Securities Co., operating near Bohemia, it was decided to move the Helena and Musick stamp mills from their present location, to the Champion mill, making one 30-stamp mill. Twelve concentrating tables will be added to the present equipment. In the meantime the Champion mill will be run at full capacity and development carried on in the Helena, Musick and Champion mines. A dam will be built to secure water power and an electric plant installed of a minimum capacity of 1000 H. P. to operate the mill and concentrators and furnish power and light for all purposes. It is estimated that these improvements will involve an expense of \$100,000.

GRANT COUNTY.

The directors of the Dixie Meadows G. M. Co. have decided to erect a mill at their mine at the head of Ruby creek, near Prairie City, says the Miner. R. C. Reese is superintendent.

The Black Jack group of copper claims, near Susanville, have been sold to the Black Jack G. M. Co. The Prescott gold placer claims were included in the sale.

WALLOWA COUNTY.

The Electrolytic Copper M. & S. Co. has incorporated at Asotin, Wash., to operate a group of eight claims south of the mouth of the Imnaha river, near Imnaha. The company has a mill and smelter site, water power and timber reserve. R. C. Mitchell of Minneapolis, Minn., is manager. Development work will begin this spring.

PENNSYLVANIA.

Reports from Philadelphia state that the anthracite coal tonnage for January was 5,900,000 (which is the largest in the history of the business), the tolls on which to the railroads amounted to \$10,000,000. The coal companies owned by the railroads have an extra profit of 50 cents per ton.

SOUTH DAKOTA.

CUSTER COUNTY.

Tubbs & Co. report pay gravel has been opened up on their placer ground near the Old Bill mine, north of Custer. At present they are getting out dirt and preparing to sluice it in the spring when water is available.

LAWRENCE COUNTY.

E. Hanschka of Deadwood has bought the Anderson & Hogan group of claims on Bear Butte creek, southeast of Deadwood, and the initial payment made. There are 150 acres in the tract. A shaft 45 feet deep and a crosscut show the vein 12 feet wide, which assays \$8.

The cyanide mills of the Asp and Alder creek companies, on Yellow creek, a mile from Lead, are adding \$25,000 a month to the gold product of South Dakota. Their mills are working on ore bodies in the Cambrian formation.

The Oro Hondo M. Co. has bought the Keno-Fraction-Brilliant group of claims,

southwest of the Oro Hondo hoist on Whitewood creek, near Lead City, a total area of 100 acres, for \$99,000.

PENNINGTON COUNTY.

A shaft is being sunk by the McGonigal G. M. Co., on the Stella Sterling claim, southwest of Keystone. It started on a 6-inch vein of ore at the surface, which has widened to 5 feet and carries gold. Considerable water has been encountered.

An examination of the Ida Florence mine, near Keystone, is being made by T. R. Griffith of Breckenridge, Colo., for Chicago men, who contemplate buying the group. D. Sisk, superintendent, says he will sink the shaft 150 feet farther, a total depth of 350 feet.

TEXAS.

HARDIN COUNTY.

The Union Oil R. & F. Co. have their plant at Beaumont in operation.

C. E. Theile, H. E. Smith and G. A. Hill of Beaumont, propose to install a refinery at Sour Lake, the oil from several of the wells being too heavy to run through the pipe line until the sulphur and asphaltum have been extracted.

JEFFERSON COUNTY.

Drilling operations are resumed at Big Hill, near Beaumont, by the Texas Oil Fields, Limited, an English company. They are using rigs similar to those used in Baku Russia, fields, which are said to have double the force of the American standard cable rigs in drilling through rocks.

UTAH.

BEAVER COUNTY.

Manager Moore is reopening the Atlas group of mines at Shauntie under an option for \$100,000. The Atlas group of twenty claims is 9 miles southwest of Milford, near the Burning Moscow. At the bottom of the incline shaft at a vertical depth of 200 feet he has opened up a 20-foot body of ore, a concentrating proposition, and with it 2 feet of shipping ore, which assays 25% lead, 30 ounces silver and \$1.20 gold. A concentrator will be installed to handle the former.

The Reciprocity M. Co., near Frisco, reports having opened up in their tunnel a body of ore averaging \$1 in gold, 25% lead and 30 ounces silver.

The 12-ton gasoline hoists for the Harrington-Hickory and the Vicksburg, near Milford, were hauled out to the mines last week, and the 5-ton rock breaker at the Campbell mill was taken down to the smelter. Fourteen horses were used in hauling the hoists on a truck weighing three tons.

Manager G. S. Hayes the Wild Bill M. Co., operating the Burning Moscow and Wild Bill groups, near Shauntie, says they are sending to the valley smelters ores which are netting the company \$507 per carload. Of this, four cars have been shipped, with a considerable tonnage ready to ship. Three and one-half feet are showing in the breast. In the Wild Bill claim are 8 feet of ore which shows an average of 31% lead, nineteen ounces silver and 3% copper.

CARBON COUNTY.

Superintendent Lee of the Gilson Asphaltum Co., near Price, says they will ship 500 tons this month.

IRON COUNTY.

The management of the Margaret group of mines at Stateline, controlled by G. H. Smith of Salt Lake, report having uncovered a new body of ore on the 150-foot level, which averages \$13 per ton in gold and silver.

The mill and cyanide plant of the Johnny M. Co. at Stateline are in operation. The capacity is fifty tons daily. It is reported the Ophir mill will resume.

JUAB COUNTY.

At a meeting of the stockholders of the Uma Con. M. Co., of Salt Lake City, the main office of the company was removed to Robinson.

Superintendent Legg says the Uncle Sam M. Co. propose to install a concentrating plant this spring at their mines near Eureka.

It is estimated that with its own smelter the United States M. Co. is reducing Centennial-Eureka ores at one-third the cost under the contract with the American S. & R. Co. The United States property is shipping to the smelter 600 tons daily, together with 250 tons from the Centennial-Eureka.

Manager P. J. Donohue says he will reopen the Opex mine, near Robinson.

The producers of Tintic district, around Eureka, have appealed to the railways operating between the loading stations of that district and the valley smelters for such revision of the tariff as shall enable them to mine ores of a maximum value of \$20 per ton under the \$1.50 rate estab-

lished last season. With the privilege asked of the railways the producer sees how an ore which does not exceed \$10 in valuation may be to an extent mixed with that which has a valuation of \$20. This, as a rule, will conform to the requirements of the present traffic, which restricts the \$1.50 rate to a \$15 maximum, and yet, as at present, such care is required in the sorting and in averaging the contents of a lot that the production of ore under \$15 is practically heretofore of profit. It is contended that with the maximum raised to \$20 the tonnage can at least be doubled and the earnings of the railway correspondingly increased.

Superintendent B. P. Howell of the Dalton mine, near Eureka, says sinking will be resumed on the east and west vein. The shaft is down 240 feet. For some distance the shaft was sunk on the vein, but a change of dip carried the vein south while the shaft was cut under it. The direction of the shaft at bottom has been changed so that the skip can be run out and down on the vein as sinking progresses.

SALT LAKE COUNTY.

Copper production in Salt Lake valley, says the manager of one of its principal smelters, has reached approximately 3,500,000 pounds per month.

Manager G. H. Robinson, of the Tintic M. & D. Co., owning the Yampa mine at Bingham, says they have bought the Bingham Copper Belt Railway. The road will be extended from the Commercial mine down Carr fork to the Yampa.

The United States Co. will increase its bins and railroad terminal facilities at Bingham before the fifth furnace at the smelter is blown in.

Manager T. Jacobson of the Columbus Con. M. Co., near Alta, says an 8-inch shoot has been cut in the main tunnel, which assays 5% copper, 400 ounces silver, and \$6 gold. He expects to cut the main ore body in 60 feet more.

It is reported that the United States M. Co. at Bingham, with three furnaces in operation, show profits of \$100,000 a month, and with four furnaces the profits are a third greater. A fifth furnace is to be blown in. The management has decided to enter the market for siliceous ores, for treatment at its smelter.

An 8-inch ore body is reported opened up in the Columbus mine, at Alta. It was struck in the tunnel, which is in 1150 feet, and assays \$10 in gold, 402 ounces silver and 15 1/2 per cent copper. During the driving of the tunnel six fissures have been cut, and it is supposed that these will unite in one body at a point 80 feet farther in, says Manager Jacobson.

The management of the Yampa mine at Bingham will not wait the extension of the Copper Belt railway to its loading station, as originally designed, but under contract with resident ore haulers, will begin at once the delivery of its copper and gold-bearing product at the furnaces of the Bingham Con. smelters, with which it has contracted for the treatment of 30,000 tons. Superintendent W. J. Craig reports the work of opening up the ledge and blocking out the ore bodies progressing. Since the vein was cut they have driven 300 feet on its strike. The raise from the tunnel level has reached an elevation of 100 feet in ore, with the incline at 900 feet, going down in ore, the interval being 700 feet. Near the 900-foot station the incline has cut another cross-fissure, in which 4 feet of ore, carrying 20% lead, twelve ounces silver and 12% copper were shown.

WASHINGTON.

FERRY COUNTY.

C. V. Ewell, a director of the Silver Creek M. & M. Co. at Kellar, says the company will buy certain adjoining claims and equip the Gold Cord mine with machinery. A concentrating plant will be installed in the spring. Twelve men are at work in the mine, crosscutting and blocking out ore.

Superintendent Angus of the Quilp mine, near Republic, says fourteen cars of ore per week are being shipped to the smelter. A drift has been run south from the winze on No. 4 level and is in a 24-foot ore body.

The Faithful-Surprise M. Co.—the consolidation of the Faithful and Surprise groups of seven claims—at Danville made a test shipment of fifteen tons last week to the smelter at Boundary Falls, B. C., which yielded \$18 per ton net. Work will be resumed on the Faithful tunnel, in 375 feet, which will be driven to a point 200 feet below the present workings on the Surprise group.

E. W. Dickson of Seattle, special agent of the General Land Office, has seized at Republic wood and timber cut for stulls and lagging in the mines, cut on government lands in the north half of the Colville reservation. Notices are being served for payment to the government for timber cut on adjoining unoccupied

mineral claims in the district. Among mines affected by this decision is the Quilp G. M. Co., E. J. Roberts president.

The Little Chester mine at Sheridan, near Republic, has been leased to Elisman & Court for two years on 10% royalty. The Little Chester is 2 miles south of the Zila M. and has a vertical shaft down 100 feet.

The shaft at the California mine, near Republic, is being retimbered preparatory to sinking from the 500 to the 600 level. Owing to the swelling of the hanging wall country rock, the lagging has occasionally to be removed and some of the ground broken down to relieve the pressure. A larger hoist will be installed.

The Apollo M. Co., near Republic, will increase their capacity by putting in a hoisting engine of 1000 feet capacity, air compressor and machine drills. Work on the shaft will be resumed.

LEWIS COUNTY.

The Victory group of six claims, in Ibeh district, on the west fork of Silver creek, above Mineral City, has been bonded to a Minneapolis syndicate for \$30,000. There are six ledges opened up, with an average width of 5 feet, showing copper pyrites, arsenical iron and galena, carrying gold, silver and copper.

OKANOGAN COUNTY.

The Palmer Mountain Tunnel Co. has bought a site for an electric plant to be built this spring near Loomis.

The Six Eagles G. M. Co. is to build a 100-ton concentrator at the mine on the Similkameen, near Loomis.

STEVENS COUNTY.

Superintendent Manning says he has cut into a body of ore carrying tellurides in the Easter Sunday mines, near Bossburg, in the north drift from the 150-foot level. Some of the ore assays \$100 per ton.

Because of a lack of coke due to the strike in the collieries of the Crow's Nest Pass Coal Co., near Fernie, B. C., the Le Roi Co.'s smelter at Northport has closed down.

A contract has been let for 300 feet of tunnel work on the Blue Bell, on Sophia mountain, near Northport, for \$8 per foot, says D. Bennett, part owner.

A bill has been introduced in the Senate empowering J. P. Graves of Spokane to construct a dam in the Columbia river at Kettle Falls to develop electric power for mining and industrial use.

Superintendent P. W. O'Brien says he has opened up 4 inches of gold-copper ore in the tunnel of the Tenderfoot group, near Bossburg. Small lumps of tellurides are found.

WYOMING.

CARBON COUNTY.

A strike of copper ore is reported made in the Copper Blossom shaft, near Encampment, at a depth of 93 feet. The vein is 4 feet wide of quartz, 2 feet of which carries copper sulphide, making it a smelting proposition. The Copper Blossom is on the east side of Cow creek and owned by the Copper Age Co.

FOREIGN.

AUSTRALIA.

QUEENSLAND.

Payable ore was struck in the 750 level of the Mount Morgan mine in November, the assays averaging 1 oz. 4 dwts. 16 grs. The average grade of the ore treated in the second half of 1902 was 12 1/4 dwts, that of the oxidized ore being 13 3/8 dwts, and that of the muncie ore being 11 1/2 dwts. The mining of this oxidized ore was done entirely by open cutting during the last half year. Most of the ore was taken from the 196 feet and 252 feet benches. A new bench is now being made on the main tunnel level (286 feet below the original top of the mountain). This carries the open cut down to the level of the West works; and for the transport of all oxidized ore below this level an inclined drive is being put down from the main tunnel to the Grassie level, which is approximately the bottom of the oxidized ore bodies. The pay ore and overburden mined from the open cut were as follows:

	Tons.
Pay ore (oxidized).....	57,987
Overburden	53,980

Total

111,967
The half-year's supply of sulphide ore was taken from underground workings as follows: Total sulphide ore mined, 61,039 tons. In mining this 9211 tons of worthless ore were removed, of which 156 tons carrying high sulphur values were sent to the acid works for making sulphuric acid; 931 feet of driving and 743 feet of rising and sinking represent the development work for the half year. Most of this was for ore ways.

BRITISH COLUMBIA.

Manager J. B. Hobson of Cariboo stated at the mining managers' meeting held in Victoria last week that the Hydraulic G. M. Co. had in eleven years expended \$1,900,000 in equipment. It had uncovered \$1,077,000 in gold, all of which had been put back in developing the property. The Horsely Co. had expended \$350,000 in opening and equipping, and \$180,000 had been uncovered.

The Lardeau Valley Mines, Ltd., has added three more claims to its group on Tenderfoot creek, near Lardeau, making a total of ten claims, and crown grants are being issued on the entire property, says Secretary J. Mackenzie. Arrangements are being made to open the property on a large scale. The ore is concentrating and carries one ounce in gold per ton. The vein on the John L. claim is 12 feet wide, with an ore shoot of 4 feet. An aerial tramway will be constructed this summer to transport the ore from the mine to the railroad—1 mile.

Gold quartz has been found on the Coronation ground, 8 miles south of Gerard, and 1 mile from the C. P. R. R., say H. E. Rogers and H. Smidt, owners of these claims on Rapid creek. They have a tunnel in 270 feet. Assays made of samples taken across the lead in the No. 2 tunnel on the North Star claim gave \$39 in gold.

From the six leading mines of the Boundary district the tonnage for January was as follows:

	Tons.
Granby mines.....	28,824
Snowshoe.....	5,880
Mother Lode.....	10,231
Sunset.....	943
B. C. mine.....	3,240
Emma.....	3,870
Total.....	52,988

The Arlington mine, near Slokan, will erect a mill operated on the electro-magnetic separation and cyaniding processes.

Lime and brick are being hauled to Granby smelter at Grand Forks for the enlargement of the plant. Two additional furnaces making six in all, are to be installed this spring, giving a capacity of 2200 tons. To the electrical plant a transformer capacity equivalent to 1200 H. P. will be added, making a total of 1700 H. P. supplied by the Cascade Power Co. The Granby Co. has 1100 H. P. developed at its own power house on the north fork of Kettle river. The output of blister copper now amounts to 1000 tons monthly.

The Rock Creek coal lands west of Midway have been sold to the Ashnola Smelter, Ltd. A 4-foot seam of coking coal has been exposed and development work will begin by March 1st. A battery of coke ovens will be built. A 12-mile section of the Midway & Vernon Railroad will be built to connect the coal fields with the C. P. R. and Great Northern at Midway.

Manager C. H. Mackintosh, of the Giant M. Co., near Rossland, says the samples of ore sent for analysis to metallurgists in Swansea, Wales, returned: Molybdenum, 24.2%; nickel, trace; cobalt, 1%; bismuth, 0.19%; arsenic, 1.8%; sulphur, 23%; copper, trace; lead, trace; gold, 4.14 ounces per ton; silver, 1.02 ounces per ton; silica, 35%; iron, 12.5%; oxygen, lime, magnesia, 2.3%. There being no plant in the Kootenays which will recover the molybdenum, the ore will be shipped to Swansea, Wales.

A second gold bar, weighing 150 ounces, has been shipped by the Broken Hill M. & D. Co. and represents the balance obtained from the first cleanup at the Wilcox mill, near Ymir. The run was five weeks and the product \$1000 in bars and concentrates, running \$40 per ton. One carload of concentrates has been shipped. The ore averaged \$12 per ton.

Miners of Nanaimo have gone on strike, 800 men going out against the Western Fuel Co. of San Francisco, which recently acquired the mines. The miners are asking for an advance from March 1 to 80 cents a ton, 25 cents a day for using safety lamps, claiming that coal cannot be got under as quickly with the safety lamps, and they ask for \$1 a ton more for mining in the lower level, which runs under the sea.

The output of coal from the Crow's Nest Pass coal mines for January was the largest in the history of the company, being 55,000 tons.

The miners at Michel, Fernie and Morrissey, in the mines of the Crow's Nest Pass Coal Co., are out on strike. The main reason seems to be the rate of 40 cents a ton at Morrissey, which the miners claim is insufficient. Manager Tonkin says the company is prepared to resist the demands of the men, if need be for eight months. The War Eagle and Centre Star mines at Rossland are arranging to get coal from Galt, Alberta; and Le Roi mine will get coal from Washington. The strike has caused the closing of Le

Roi Co.'s smelter at Northport, Wash. Both the Trail and the Granby smelters are said to have but a short supply of coke and coal on hand. The British Columbia C. Co., at Greenwood, have a month's supply of coke in their bins.

The Boundary Coal Mines, Ltd., has been organized at Spokane, Wash.; C. E. Mitchell, E. T. Bartlett, W. H. Myers, P. F. Godenrath, W. S. Fairfield, G. A. Macleod. The company has obtained licenses covering 2580 acres. In the coal basin 60 miles north of Grand Forks, toward the head of the North Fork of the Kettle river, the coal is bituminous. It is intended to use a portable horse-power diamond drill to prospect.

CANADA.

The gold production of Canada for 1902 was 943,391 ounces, valued at \$19,500,000.

MEXICO.

CHIHUAHUA.

The Montezuma group of gold mines in the Topago district have been sold to the United M. & E. Co. of Los Angeles Cal., for \$5,000,000. It is stated that \$500,000 will be expended on development and equipment of the property.

The semi-annual report of the Palmarejo & Mexican Gold Fields, Ltd., for the six months ending Dec. 31, 1902, has been issued and shows that 16,470 tons of ore were crushed and 14,062 tons treated, showing a gross product of \$259,400, of which \$72,550 was gold and \$186,850 silver. The profit was \$78,625. This period covers October, when by reason of an accident to the conduit, the profit was only \$1825. The quantity of ore crushed is, approximately, 10,815 tons dump ore, 5165 tons Palmarejo mine ore and 490 tons La Patria ore. The results have not reached the estimate, the principal causes being insufficiency of miners, deficiency in cyanide tank capacity and loss through slimes. Four additional tanks of large capacity are being erected. Two will be completed by the middle of February. A large pit has been built to save slimes for future treatment. Manager A. P. Griffiths recommends a slimes plant.

The Montezuma group of gold mines, in the Topago district, have been sold to the United M. & E. Co. of Los Angeles, Cal., and \$500,000 is to be used on development and equipment this year.

F. Kahn shipped fifty-nine sacks of ore last week, assaying \$800 gold per ton, from La Gloria, Santa Elena y Anexas, near El Oro.

Arrillano, Urias & Co., having concessions for two smelting works with a minimum capacity of 200 tons daily, one to be erected at Parral and the other at Jimenez, will begin operations this month.

The Dolores mine is locally reported sold to the Venture Corporation of London, England, for \$1,250,000.

HIDALGO.

The mines at Pachuca are producing 7,000,000 ounces of silver annually.

SAN LUIS POTOSI.

The silver mine of La Paz in Matehuala has struck a new ore body. The production is 4000 tons monthly of 50-ounce ore, which is being taken out by leasers.

SONORA.

Secretary R. V. Daniels of the Gold Treasure M. Co., 8 miles from Naco, on the southwest slope of San Jose mountains, says a road will be built up the canyon to within 1000 feet of the mine, which will be connected with the property by a gravity tramway. The present plan is to ship, but a reduction plant will go in later. Their group consists of 724 pertenencias.

The Yaqui S. & E. Co. has been incorporated by Toledo, Ohio, men, with headquarters at Hermosillo, and will build a 100-ton smelter at San Antonio de la Huerta, 100 miles east of Hermosillo.

The Sonora E. & M. Co. has incorporated at Douglas, Ariz.; R. N. and J. M. French, L. F. Martinez, F. Castro, A. C. Lubbert and G. H. French, to operate a silver mine in the La Purica mountains, a copper group of 100 pertenencias in the Sierra de la Ceniza, and a silver-lead mine on the opposite side of the mountain from the Pavo Rico; also, a group of copper prospects 25 miles southeast of Douglas.

The Bisbee Review says the smelters at Cananea are closed down for an indefinite period on account of the strike on their narrow-gauge railroad.

The Cananea Herald says the interests of the Creston-Colorado M. Co. at Minas Prietas have been sold to a syndicate of Chicago and New York men, headed by J. W. Gates, for \$6,000,000.

Twelve miles south of Atlix, in Altar district, N. H. Brown & Co. of San Bernardino, Cal., are developing the San Augustine mine. They have a ledge 60 feet wide which runs 6% copper, 33 ounces silver, and some gold. A reduction plant is proposed.

W. Lahbert & Co., of Minas Prietas, are developing a copper group near San

Javier, in Hermosillo district. They will erect a smelter.

T. P. Lloyd & Co. have bonded the Beaverich mine, 20 miles north of Sahuaripa, and near the Yaqui river. The Bufo M. & M. Co. are shipping ore and concentrates from their mines near Sahuaripa.

W. E. Defty has bought a one-fourth interest in the Yaqui mine, adjoining the Martha, owned by Talbot & Co., near Altar.

MONGOLIA.

The Franco-Russian Co. des Aimaqs, V. Von Grot manager, are developing quartz and hydraulic properties in Touchetoukon and Tsentsenkan districts. Assistant Manager G. A. Blegow says he will this spring open up additional hydraulic ground in the eastern part of their holdings.

SOUTH AFRICA.

From the new alluvial deposits worked by the Pretoria District Diamond Co., the yield is reported to have improved from 30 carats per 100 loads to 50 carats per 100 loads in recent washings.

At the Wolhuter mine, near Johannesburg, burg, milling operations have not been started since the war, owing to scarcity of native labor. Work has been concentrated on opening up the deeper levels of the mine. The manager estimated the total cost of this sinking by white labor at little over £20 per foot, being 20% higher than the cost by Kaffir labor, if employed in the usual manner on this class of work, and says he has concluded that white labor can never successfully compete on economical grounds with native labor on the mines.

The report of the Chamber of Mines of the Transvaal shows that the production in December was 196,023 ounces of fine gold. This makes the production for the year 1902 a total of 1,704,410 ounces (\$35,230,155), or nearly one-half of that reported for 1898, the year before the outbreak of the war.

SOUTH AMERICA.

ECUADOR.

The Zaruma is being worked. The South American Development Co. are the owners, in the district of Zaruma, Province of El Oro. All the work is through tunnels, the lowest and principal tunnel being 2300 feet in length, reaching a depth of 650 feet. The rock is blue and white quartz, carrying 10% sulphides of lead, zinc, iron and copper. Some free gold is found. The formation is andesite. There are placer mines in the Province of Esmeraldas, owned by the Playa de Oro M. Co. of New York City.

GUIANA.

No lode mining is carried on in the district. The only mineral produced is gold, which is obtained in the placers. Occasionally specimens of ore are found, but no considerable paying deposit has ever been discovered. The country rock is similar in all the mining districts of the Guianas, and is diabase and quartz porphyry schists. The payable quartz is found in masses of decomposed diabase. The placer claims are numbered, but no record of production is kept. The annual production is reported at about 200,000 ounces.

PERSONAL.

F. JAGER has returned to Chicago from Prescott, Ariz.

P. L. KIMBERLY has returned to Salt Lake City, Utah, from the East.

W. A. ALDRIDGE of the Trail smelter, Trail, B. C., is in Spokane, Wash.

J. H. GRAHAM has returned to Baker City, Or., from a trip to Pittsburg, Pa.

J. R. BOND is superintendent of the Green Canon mine, near Aguilar, Colo.

B. F. GRAHAM of B. F. Graham & Co., Bisbee, Ariz., has gone East on business.

J. BEDIER is superintendent of the North San Poil mine, near Republic, Wash.

F. H. BULL of the Bull-Kimberly mines, Utah, is in Salt Lake City from the East.

R. S. BAVERSTOCK of Los Angeles, Cal., is examining mining properties at Nacozari, Mexico.

D. F. MEIKLEJOHN, E. M., is at Sierra City, Cal., where he is working chlorination tailings.

L. W. FELT, manager of the McCabe mine, McCabe, Ariz., has returned from Denver, Colo.

P. M. MCCREE is manager of the Blackbird M. Co. mines in Copper gulch, near Milford, Utah.

J. W. FINCH of Victor, Colo., has been

reappointed state geologist of Colorado by Governor Peabody.

H. N. GAILER, assistant manager of the Granby smelter at Grand Forks, B. C., is in Spokane, Wash.

MANAGER P. W. MADSEN of the Century mine of Park Valley, Utah, is in Chicago on business.

F. N. BURK has resigned as secretary and manager of the Bertha mine, near Idaho Springs, Colo.

H. F. POLAND, manager of the Indian Co.'s mines and mill at Pony, Mont., is traveling in California.

GEO. E. NOLAN, manager Nevada Engineering Works, has returned from San Francisco to Reno, Nev.

W. B. DOUGALL JR., treasurer of the Bingham-Centennial Co. of Bingham, Utah, is in Denver, Colo.

R. D. LEONARD, superintendent of the Pacific Development Co., near Elk City, Idaho, is in Butte, Mont.

G. WEHE has resigned as manager of the Night Hawk M. Co. on the Similkameen river, near Loomis, Wash.

E. E. ANFORD has succeeded G. Bertsey, Jr., as superintendent of the Tykoon M. Co., near Keystone, S. D.

W. A. STEVENS of the Buffalo Hump mines, Buffalo, Idaho, is in San Francisco, Cal., on his way to Inyo county, Cal.

TREASURER MUCKLOW of the Majestic M. Co. has returned to Hartford, Conn., from their mines near Milford, Utah.

A. LAWRENCE has resigned as assayer at the Cave mine, near Milford, Utah, and has gone to Salt Lake City, Utah.

BENJ. BLANCHARD is now general manager Iron King mine, near Prescott, Ariz., operated by the American Copper Co.

G. D. B. TURNER, manager of the J. I. C. mine, has returned to Park City, Utah, from an extended trip to Europe.

E. W. GRIFFITH of Salt Lake City, Utah, has been inspecting the Martha Washington mine in Tintic district, Utah.

W. A. ENGLE of Attleboro, Mass., is at Boulder, Colo., inspecting the Wall Street property, in which he is interested.

A. J. FROELICH, superintendent of the Hull mine, near Groveland, Cal., has returned from a business trip to San Francisco, Cal.

JAS. A. MCILWEE is superintendent of the Practical G. M. & L. Co. at Cripple Creek, Colo., and John McIlwee is assistant superintendent.

PRESIDENT J. W. RUSSELL of the Blackbird M. Co., near Frisco, Utah, has gone East, accompanied by Directors Van Tassel and Kimball.

L. B. SKINNER, formerly with the Standard mill at Colorado City, Colo., is superintendent of the Portland mill at Cripple Creek, Colo.

T. H. ELLIS, president and manager of the Yellow Jacket M. Co., at Wyndham Bay, near Juneau, Alaska, is in the East on company business.

H. C. TAYLOR, a manufacturer of Worcester, Mass., is in Salt Lake City, Utah, visiting mining properties in that section in which he is interested.

S. LEVY, assistant manager of the Western M. & E. Co., has returned to Salt Lake, Utah, after a visit to the New Pass mines, near Austin, Nev.

F. CAMERON, general superintendent of the Utah Coal Co., at Castle Gate, Carbon county, Utah, has changed his headquarters to Salt Lake City, Utah.

H. P. GORDON has been appointed superintendent of the New Montezuma mine at Nashville, El Dorado county, Cal., vice T. B. Dillon, resigned.

O. TOWNSEND has resigned as manager of the Baby McKee & Last Chance Con. Co., near Sumpter, Or., and will be succeeded by Superintendent Hennessy.

G. WYMAN, who has been superintending development of the Animas mine, of which he is part owner, at San Javier, Sonora, Mexico, has returned to Cleveland, Ohio.

SUPERINTENDENT J. A. KIRBY of the Daly West mine at Park City, Utah, has returned from Nevada City, Cal., where he has been starting development on the Polar Star mine.

H. E. FORSTER, operating the Trade Dollar mine at Republic, Wash., president of the Curlew M. Co., accompanied by T. O'Brien, the vice-president, is in Spokane, Wash. They will return this week via Vancouver and Golden, B. C.

JAS. CONSTABLE, formerly manager Phoebe Exploring Association, Ltd.,

London, England, is now superintendent Virginia mine, Greenhorn, Or., operated by the N. P. M. Co. of Seattle, Wash.

R. B. HARPER of San Jose, Cal., is general manager and consulting engineer of the Santa Teresa Quicksilver M. Co. of Boston, Mass., operating the Santa Teresa mine, near San Jose, Cal., and mines in Mexico.

ASSISTANT MANAGER G. A. BIGELOW of the Franco-Russian Co. des Almaks in Touchetoukon and Tsetsenkan, Mongolia, is in San Francisco, Cal., and leaves this week for the properties in northern Mongolia.

FRANZ MEYER, Ph. D., metallurgical and chemical engineer, formerly manager of the Grillo Works at Oberhausen, Germany, has been appointed general manager of the Wetherill Separating Co. The office of this company will hereafter be at 68 Broad street, New York.

Commercial Paragraphs.

D. B. BISBEE has bought the laboratory of G. H. Ellis, Chicago, for assaying and mine examination.

J. H. KINKHEAD has shipped one of his ore crushing mills to Tonopah, Nev., to the pioneer mill of that camp.

O. R. MORRIS is finishing the quartz mill and cyanide plant construction by Joshua Hendy Machine Works at the Iron King mine, 16 miles from Prescott, Ariz.

THE Union Iron Works, San Francisco, Cal., report having received the past week a contract for a 40-stamp mill for the Fremont Con. M. Co. in Amador county, Cal.

THE C. O. Bartlett & Snow Co. of Cleveland, O., write that they have lately received orders for their special Common Sense conveyor for conveying clinker, capacity 1750 barrels per day, from the Bronson Portland Cement Co., Bronson, Mich., also from the Omega Portland Cement Co., Jonesville, Mich.; also have an order for one of 1000 barrel capacity from the Egyptian Portland Cement Co., Detroit, Mich.

THE Wm. Powell Co., Cincinnati, O., state that they are now making an improved valve which they designate as their White Star, and "the peculiar feature about it is that it is not only re-grinding but the disc is reversible, that is, being double faced, after one side is worn out the disc can be turned over and a new face brought into use. In addition to this, when the disc is entirely worn out, it can be replaced with a new one, so it combines the two essential features of all high-grade valves in the market."

Catalogues Received.

"Cement Machinery" is the subject of Catalogue No. 15 of the Allis-Chalmers Co., Chicago, the sixth edition of which is issued in sumptuous style. There are seventy-two pages of finely illustrated description of machinery designed for the economical manufacture of Portland cement.

The 1903 catalogue and price list of Keuffel & Esser Co., 127 Fulton street, New York, is a 500-page octavo with all the solidity of a bound book and all the flexibility of a pamphlet. It is a complete exposition in black and carmine of this firm's makes of drawing materials, surveying instruments, and general supplies used by engineers in office or field work. About 400 of the illustrations are copyrighted. The present is the thirty-first edition of this work and excels even its predecessors. Its price is 50 cents. The company's branch offices are at 111 Madison street, Chicago; 708 Locust street, St. Louis, Mo., and 303 Montgomery street, San Francisco, Cal.

Books Received.

"Engineering for Land Drainage." This is a manual for the laying out and constructing drains for the improvement of agricultural lands by Charles G. Elliott, C. E., 232+VII pages, 41 figures; cloth, \$1.50. It gives much information on the subject indicated in the title, and will prove of great value to those who have low, marshy tracts of land which they wish to till or otherwise improve. John Wiley & Sons, New York and London.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING FEB. 10, 1903.

- 719,987—SPEECH RECEIVER—S. J. Ballard, Los Angeles, Cal.
720,115—HORSESHOE CALK—A. Corcoran, Seattle, Wash.
720,128—SALTING MACHINE—J. W. Gheen, Astoria, Or.
720,345—DISPLAY PACKAGE—P. R. Hazeltine, Los Angeles, Cal.
720,353—VEHICLE WHEEL—R. E. J. Hery, Grass Valley, Cal.
720,443—CABLEWAY—W. King, Blue Lake, Cal.
720,158—TWIN CUTTER—Knowles & Dickson, Santa Ana, Cal.
720,260—ROLL LAP ROBE—Kutscher & Auradon, S. F.
720,279—RURAL MAIL BOX—M. S. Norton, S. F.
720,471—PRESERVING JAR—Mary E. Perley, Peris, Cal.
720,176—SOIL SCRAPERS—G. N. Perry, San Diego, Cal.
720,476—BOTTLE—Plummer & D. vis, Salem, Or.
720,283—REMOVING SURPLUS METAL—Geo. Porter, S. F.
720,480—CRUSHING MILL—H. U. Prindle, Sacramento, Cal.
720,481—PRINTING PAPER BAGS—Purdin & Haskins, Medford, Or.
720,071—SYRINGE—J. I. Richards, S. F.
720,288—FRUIT PITTER—O. L. Scott, S. F.
720,495—OIL BURNER—C. W. Selvert, Los Angeles, Cal.
720,291—RAILWAY CAR—G. E. Smith, Pasadena, Cal.
720,080—FLY ESCAPE—W. H. Spate, Anaheim, Cal.
720,298—DOFFER—D. M. Sullivan, Rio Vista, Cal.
720,537—UMBRELLA—A. S. Venen, Forestgrove, Or.
720,548—PAPER HOLDER—R. G. Whitlock, Los Angeles, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

DOFFERS FOR FIBER MACHINES.—No. 720,298. Feb. 10, 1903. D. M. Sullivan, Rio Vista, Cal., assigned to Thomas & Ettinger, a firm of Rio Vista, Cal. This invention relates to improvements in machines for working hemp, flax ramie, or other similar fiber by which the stalks are crushed and broken so as to separate the fiber from the woody portion, and relates particularly to what is known as the "doffer," by which the fiber is carried successively from one portion of the machine to the other. It consists in the combination with a cylinder and carrier of a drum located between these two, and a cover having a series of transverse lines of holes made at intervals. A series of hollow guides are carried by the drum and springs within the guides. A series of transverse bars are arranged around the drum and have fixed points or spurs extending in line with the holes in the drum cover, said bars having their ends extended beyond the ends of the drum, and provided with rollers; said bars also have inwardly extending end portions disposed outside of the vertical plane of the sides of the cylinder, which fit the said guides and seat upon the springs therein. Cam tracks arranged outside the ends of the drum engage the rollers and retract the bars.

RURAL DELIVERY MAIL BOX.—No. 720,279. Feb. 10, 1903. M. S. Norton, San Francisco, Cal. This invention is especially designed for the delivery and collection of mail matter in rural districts and provides a box of such contour as to give the greatest capacity and resistance to injuries with the most economical construction and means by which it is readily opened to its fullest extent or locked and hermetically sealed against the elements when closed. It consists of various mechanism, including an indicator, interlocking disks, a lock, a means for the raising and lowering of the door is opened and a lever arm whereby the disks and indicator are turnable when released.

APPARATUS FOR REMOVING SURPLUS METAL FROM COATED ARTICLES.—No. 720,283. Feb. 10, 1903. George Porter, San Francisco, Cal. This invention relates to an apparatus designed for the cleansing and preparation of nails which have been previously coated with molten zinc or equivalent protecting metal and which process is technically called "galvanizing." It is difficult to clean nails of surplus adherent metal and put them in condition for use, also many times the nails become stuck together in masses when they cool by reason of this surplus metal. By means of this apparatus the surplus fused metal adhering to the nails, etc., can be cleaned off and the nails left in a smooth, merchantable condition.

FRUIT PITTER.—No. 720,288. Feb. 10, 1903. O. L. Scott, San Francisco, Cal. This invention consists of a circular revoluble disk, having an eccentrically formed opening made through it adapted to receive the fruit, and elastic cutting blades are fixed in one side of the opening, so that when the fruit is placed within the opening these blades are inserted upon each side of the pit, the outline of which they follow. The edge of the opening forms a blade, which splits the fruit, and means are provided for revolving the disk upon its supporting guide, so that the fruit being held while the disk is revolved, the inner edge of the opening will cut the fruit around the pit, while the blades follow the outline of the pit and sever the meat therefrom. The object of the device is to provide a means for rapidly splitting fruit having pits, such as peaches and the like, and at the same time separating the meat from the pit.

ROLL LAP ROBE OR STORM APRON.—No. 720,260. Feb. 10, 1903. A. G. Kutscher and J. G. Auradon, San Francisco, Cal. This invention relates to improvements in attachments for bugles and other vehicles by which a lap robe may be rolled up or unrolled, much after the manner of a window shade. Its object is to provide a means by which a robe or apron may be quickly removed out of the way of the occupant of a vehicle, as when it is desired to alight, and which will always be in position across the vehicle in readiness to be

drawn up when required. It consists of a spring-actuated roll carrier, means for pivotally supporting its ends, a lap robe secured thereto, said robe having extended lateral portions, and means for folding the robe so it may be wound upon the rollers.

VEHICLE WHEEL.—No. 720,253. Feb. 10, 1903. R. E. Jeffrey, Grass Valley, Cal. This invention relates to improvements in wheels for automobiles and other vehicles, and particularly in that type of wheels having separable hub sections. Its object is to simplify the construction, improve the means for adjusting the spokes and adapt the use of wooden spokes to a metal rim. Hitherto it has been customary to confine the use of wooden spokes to rims of like material, and converse to use only metal spokes with metal rims. The advantages of a combination of metal rim and wooden spokes are recognized, and it has been one aim of the present invention to afford a practicable means of effecting such combination.

Latest Market Reports.

SAN FRANCISCO, Feb. 20, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22s 3d (standard ounce, 925 fine); New York, bar silver, 47½c, refined (1000 fine); San Francisco, 47½c; Mexican dollars, 38 @39c San Francisco, 37½c New York.

COPPER.—New York: Standard, \$12.35; Lake, 1 to 3 casks, \$12.90; carload lots, \$12.00; Electrolytic, 1 to 3 casks, \$12.85; carload lots, \$12.50; Casting, 1 to 3 casks, \$12.75; carload lots, \$12.50. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £57 17s 6d spot per ton.

No material change in the copper market has developed the past week. A small quantity of the metal has been sold in New York at 13 cents, but it cannot be said that it is quoted at that price, though closely approximating it. Those in a position to forecast the market say it will be a matter of short time when 13-cent copper will be an accomplished fact.

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots, 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £11 15s per long, ton = 2.55c per lb.

SPELTER.—New York, \$5.05; St. Louis, \$4.60; London, £20 17s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$29.30@29.35; San Francisco, ton lots, 31c; 500 lbs., 31c; 200 lbs., 31½c; less, 32c; bar tin, 31½c @37½c. London, £133 12s 6d spot.

PLATINUM.—San Francisco, crude, \$18.00 @ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @ flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½c pure ingots, 35c; No. 2, 90½c, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.5c.

NICKEL.—New York, 50@60c @ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$23.10; gray bar, \$20.50; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$24.50@25.00
Foundry Northern 1.....	23.00@24.00
Northern 2.....	22.50@23.50
Northern 3.....	22.00@23.00
Southern 1.....	23.35@23.85
Southern 2.....	22.85@23.35
Southern 3.....	22.35@22.85
Forge.....	21.85@22.35
Charcoal.....	26.00@27.00
Billets, Bessemer.....	33.00@34.00
Bars, iron.....	1.75@ 1.85
Bars, steel.....	1.75@ 1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, boiler.....	1.90@ 2.00
Tank.....	1.75@ 1.80
Sheets, 26 store.....	2.90@ 3.00
No. 27.....	3.00@ 3.10
No. 28.....	3.10@ 3.20
Angles.....	1.75@ —
Beams.....	1.75@ —
Tees.....	1.80@ —
Zees.....	1.75@ —
Channels.....	1.75@ —
Steel melting scrap.....	17.50@18.50
No. 1 railroad wrought.....	18.50@19.00
No. 1 cast, net ton.....	17.50@18.00
Iron rails.....	24.00@25.00
Car wheels.....	23.00@23.50
Cast borings.....	10.25@10.50
Turnings.....	14.00@14.50

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, \$25@26c @ lb.; carloads, 24@24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½@30 @ lb.; caustic soda, in drums, 3@4c @ lb.; Cal. s. soda, bbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 8c; caustic potash, 10c in 40-lb tins; borax concentrated, 7@8c @ lb.; roll sulphur, 4@6c; powdered sulphur, 2@3c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2@2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5@7c; chloride of lime, spot, \$3.00@4.00; sulphuric acid, in carboys, 66½ B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$5.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.50 per 1000 feet; double tape, \$3.00; single tape, \$2.50; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Lined, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; cs., No. 1 bbl., 57½@60c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 50@55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb.; powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ lb.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5@7c.

MANGANESE.—(90% and over) @ lb., \$1.25.

MOLYBDENUM.—25c. @ gramme; 1000 grammes=2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, @ lb., \$1.25.

MERCURY.—Bichloride, @ lb., 90c.

PHOSPHORUS.—(American) @ lb., \$1.00.

SILVER.—Chloride, @ oz., 90c@ \$1.00; nitrate, 55c.

URANIUM.—Oxide, @ lb., \$3.50.

ZINC.—Metallic, chemically pure, @ lb., 50c; dust, @ lb., 10c; sulphate, @ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Gentleman to Share Office with Engineer, Wanted.

A1 LOCATION. ADDRESS R. S. THIS OFFICE

MINING AND SCIENTIFIC PRESS

Whole No. 2223.—VOLUME LXXXVI.
Number 9.

SAN FRANCISCO, CAL., SATURDAY, FEBRUARY 28, 1903.

THREE DOLLARS PER ANNUM.
Single Copies, Ten Cents.

AN interesting phase of the history of Cripple Creek district, Colo., is found in the numerous strikes of rich ore made in shallow workings, after the district had come to be looked upon as a deep mine camp. It would indicate that in the haste to gain great depth much that was valuable, and would yield a profit at comparatively nominal expense of time and money, had been overlooked. The more thorough development of the numerous mines has resulted in a better understanding of the fissure system, and this in some degree is responsible for these numerous superficial discoveries. Some companies in exploration are extending their upper levels in the light of this broader knowledge pending the completion of the first drainage tunnel. This finished, the era of deep mining will receive a

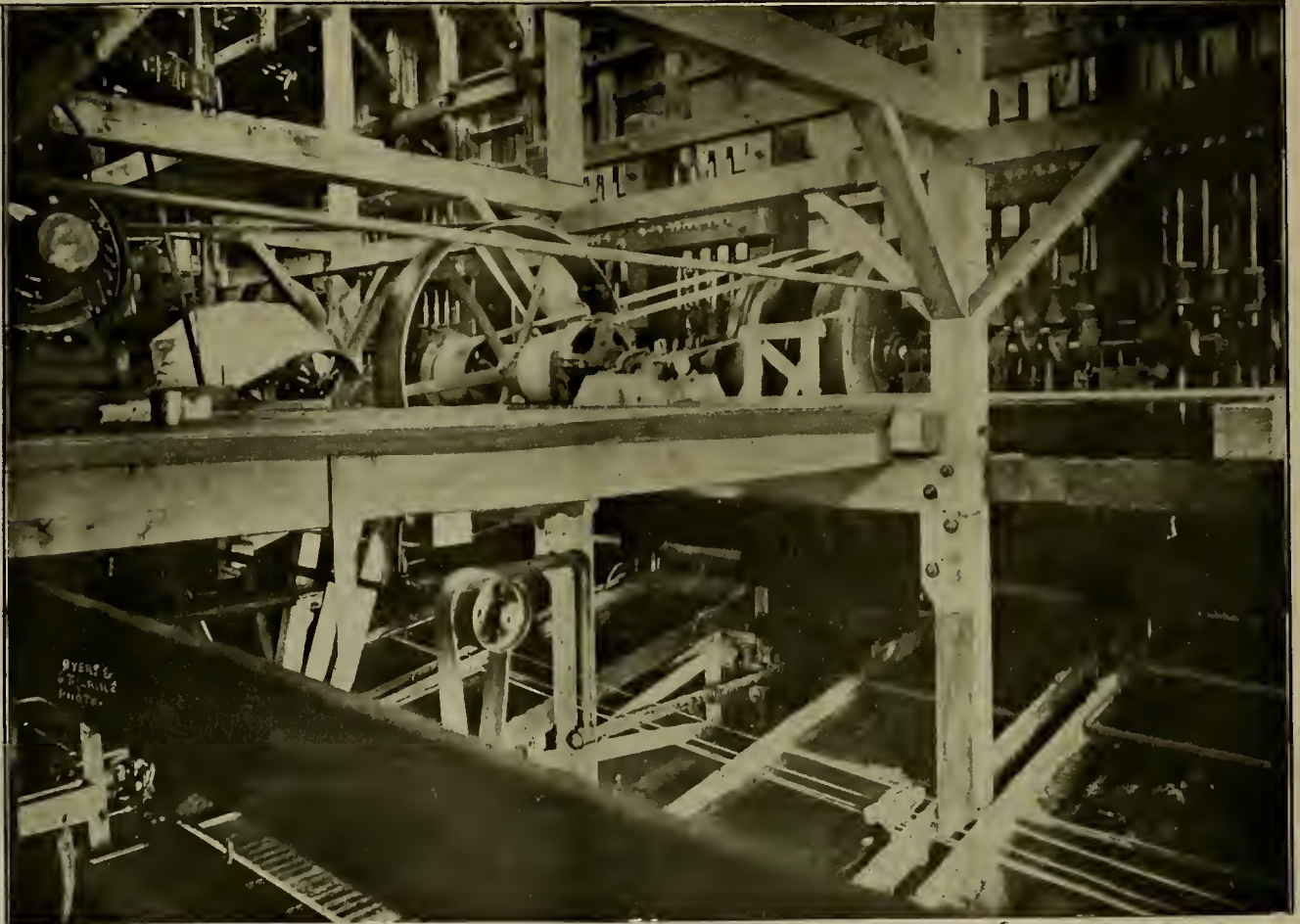


Fig. 1—General View Interior Ophir Mill, San Miguel County, Colo. (See page 135.)

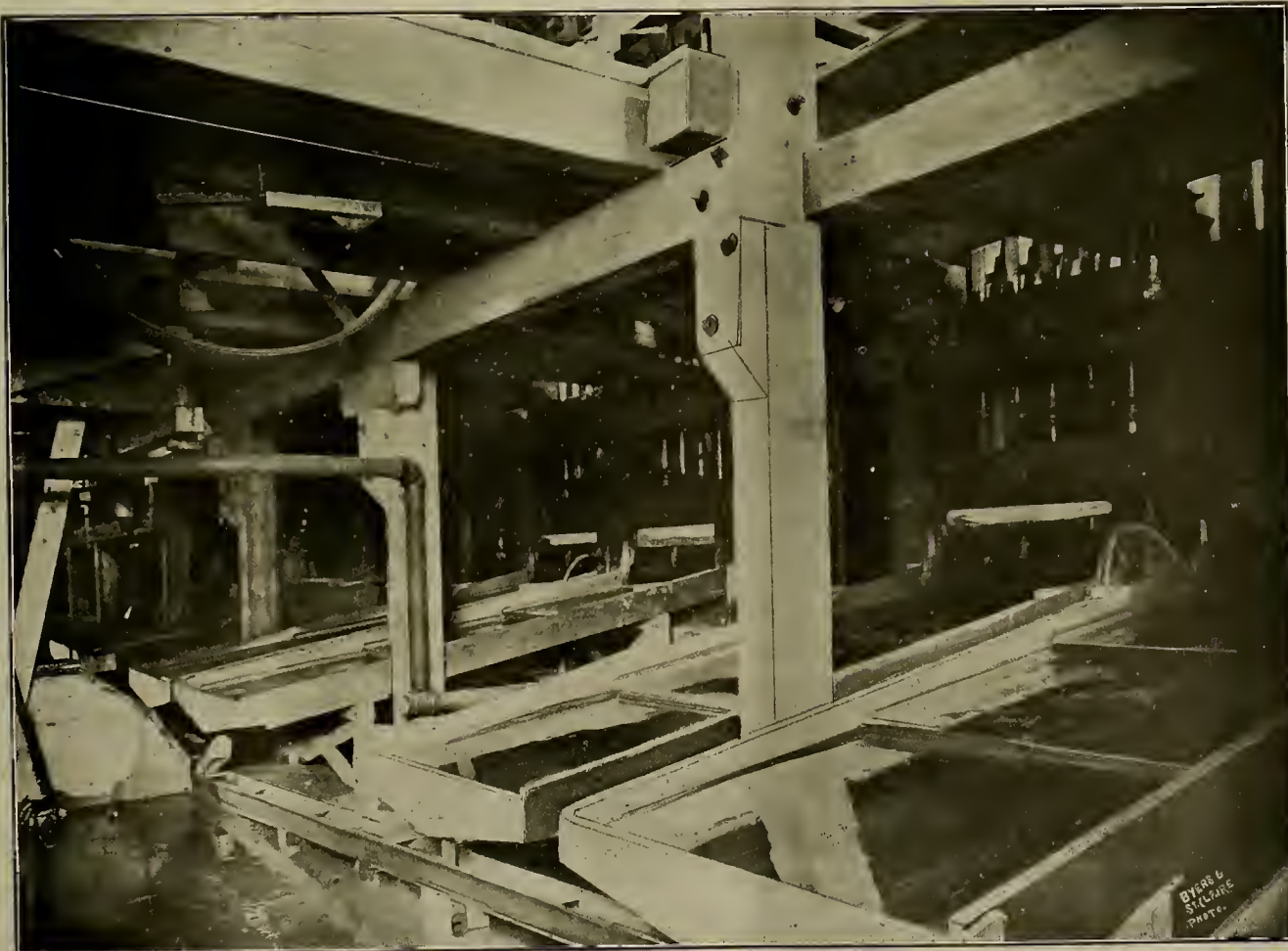


Fig. 2—The Batteries Ophir Mill, San Miguel County, Colo. (See page 135.)

new impetus, but it is unlikely that the leasers will lose sight of the highly profitable, more superficial deposits.

IN Idaho there has recently been much discussion over the various forms of mine taxation proposed. In Shoshone county the authorities assessed the mines at what they considered a proper valuation, upon which the tax levy was made. The mine owners and managers positively refused to pay this tax, though asserting their willingness to pay taxes on the improvements made on the mines as they had done for years. This course led to much discussion and the State Legislature has recently passed a law taxing the net output of mines of the State and the bill has been signed by the Governor. Up to the present no adverse comment or opposition to the law has been reported.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
General View Interior Ophir Mill, San Miguel Co., Colo.....	129
The Batteries Ophir Mill, San Miguel Co., Colo.....	129
Permanganation Plant at Sierra City, Cal.....	133
Open Trough Roller Pan Conveyor.....	133
Belt Conveyor, Ophir Mill, San Miguel Co., Colo.....	135
Loading Terminal and Ore Bins.....	136
Coal Pockets and Belt Conveyors Near Loading Terminal.....	136
Support No. 4, Lower End of Long Span.....	136
Supports Nos. 7 and 8, the Latter With Roof.....	136
Discharge Terminal.....	136
Bucket 5 Cubic Feet, With Friction Grip and Automatic At- tacher.....	136
Sheet Piling, Railroad Subway, Oakland, Cal.....	137
Cross-Section Railroad Subway, Oakland, Cal.....	137
Mining and Metallurgical Patents.....	138
EDITORIAL:	
Cripple Creek, Colo., Strikes.....	129
Mine Taxation in Idaho.....	129
Fraudulent Mine Promotion.....	130
The Sampling of a Mine.....	130
Granite a Mineral.....	130
Native Labor in the Rand Mines.....	130
The Price of Copper.....	130
MINING SUMMARY.....	139-140-141-142-143
LATEST MARKET REPORTS.....	144
MISCELLANEOUS:	
Concentrates.....	131
Boring the Tundra of the Nome Gold Fields.....	132
Search of Gold.....	132
Experiences of a Working Miner.....	132
The Theory of Missiles.....	132
Practical Application of Dr. Black's Permanganate Process.....	133
The Depth of the Dolocath Tin Mine.....	133
Open Trough Roller Pan Conveyor.....	133
Cyaniding Tests at Ely, Nevada.....	134
Lead Refining at Trail, B. C.....	134
Porcupines Destroying Trees.....	134
Mine and Mill of the Ophir Con. M. Co., San Miguel Co., Colo.....	135
Test for Precious Metals in Cyanide Solutions.....	135
Transportation at the Grand Central Mine at Robinson, Utah.....	136
Electrolytic Reduction of Lead.....	137
Subway Railroad Construction, Oakland, Cal.....	137
Ore Dressing Laboratory at Columbia University.....	137
Mining and Metallurgical Patents.....	138
Personal.....	143
Commercial Paragraphs.....	144
Catalogues Received.....	144
Books Received.....	144
New Patents.....	144
Notices of Recent Patents.....	144

Fraudulent Mine Promotion.

In these days when so many mining stocks are being offered to investors it would be both unwise and untrue to say that most of them are frauds, and should be let alone. There are many ways in which those contemplating investment in mines, but who are unfamiliar with mines and mining methods, may get reliable information concerning the particular stock offered them. The statements made by some promoters, in some of the numerous prospectuses, are so palpably false as to require no comment, as the attempted deceit is readily recognized by mining men, but the inexperienced are the easy victims of these unprincipled men with their fake schemes. The language employed by some promoters in their prospectuses bears the stamp of honesty, and even cautions investors against being duped by false representations. Certain paragraphs give ostensibly scientific descriptions of the rocks and geological formations. These sound well to the uninitiated, but the blunders in phraseology and orthography at once pronounce the writer of them as a pretender, for there are few qualified mining engineers who will lend themselves to swindling schemes of the description noted. The "words of caution" found in these fake prospectuses would be amusing if it were not for the mischief they are calculated to work.

A great many newly organized companies place the capital stock in the millions when the property is in its early stage of development, worth only a few thousand at most. The capitalization is not based upon values, but is fanciful, and dividing the stock into a large number of shares makes it seem cheap to the would-be investor. If the property has the elements of profit in it when equipped and managed it will pay; and if it pays a net profit at all it will pay it on a capitalization of several million dollars as well as on one of a few thousand.

Placing the par value of the stock at a high figure does not make the stock worth more, nor less. That there is, or can be, any real connection between the actual value of a mine and its capitalization is a delusion, and where the promoter undertakes to demonstrate that there is such connection, particularly in a partially developed mine, the connection is merely fanciful. "Overcapitalization is dangerous." This is true of industrial enterprises more than of mining concerns, but is not nearly so dangerous as exaggerated statements of value of ore in sight.

The Sampling of a Mine.

"Mine Sampling," "Ore in Sight," "Valuation of Mines," and "Mining Reports," are the titles of editorial and communicated articles recently appearing in mining journals in various parts of the country. The frequency with which articles of this character appear is an index of the great interest being taken at this time in the subjects indicated.

Any person contemplating mine investment, either as the purchaser of all or a portion of a mine, or simply as an investor in stock of an organization owning the mine, must have an unusual interest in the value, real and prospective, of the property. The examination of a mine is the first step in determining its value, and deductions made from observed facts should constitute the report.

The former comprises a careful, systematic inquiry into the extent and value of all ores exposed in the mine workings, and this includes the responsible and sometimes difficult task of "mine sampling." In making deductions the engineer is called upon to calculate the no less responsible problem of "ore in sight." The wide difference sometimes noticed in the estimates of "ore in sight" between the calculations of the engineer making an investigation for the seller, and those of the engineer who examines and reports for the buyer, probably represents the influence of the opposite interests. There is, or should be, little difference in the results obtained in careful, systematic sampling of the ore that can actually be seen and sampled, but there is often a startling discrepancy in the reports of "ore in sight" as calculated by different engineers.

To arrive at a basis for establishing the value of a mine, the engineer should be provided with accurate maps of the mine workings, showing them in plan, and in both transverse and longitudinal section. If none are available, they should be made. The workings should be divided into sections or blocks of approximately uniform size extending along the surface of the exposed ore. In drifts, for instance, the back, if not timbered, lagged, and consequently inaccessible, should be divided into blocks 25 to 50 feet in length, and within this length a stated number of samples should be taken, say every 5 feet, or every 10 feet. In high-grade ore the lesser distance is productive of more accurate results.

The method of sampling must be determined by the experience of the engineer. Manifestly a vein consisting of soft, easily cut material in which the mineralization appears to occur with uniformity, should not be sampled in the same manner as a vein of hard, flinty quartz in which the values are known, or believed to be "spotted." In the former instance a representative sample—one which may be depended upon—can be obtained by "channelling" to a depth of 1 or 2 inches and like width across the vein, at the intervals stated, care being taken that the quantity of material removed from each portion of the cross section be of equal amount. Where hard and soft streaks occur alternately the difficulties are greatly multiplied, and larger samples must be cut. In the case of the hard vein with spotted values, or, as is sometimes the case, where the rock is hard, and the values, though not disseminated with marked unevenness, are in fine, easily disturbed material, falling out of the vein upon being struck with a pick or hammer, samples taken by hand cannot safely be depended upon to give reliable results. In these and similar cases, and in large masses of low-grade ores, mill runs are the only reliable means of arriving at the desired information. What applies to drifts is also applicable to shafts, raises, winzes and stopes. The assays should be given a running number which should be carried throughout the entire mine. By this means there is less likelihood of confusion. On

the map should be entered the width of vein, and result of assay of each sample taken, together with its number.

The several blocks may be designated either by number or letter. As a check, from each rejected portion of the samples obtained in any block should be taken an amount representing relatively the width of the vein at the place sampled, and this worked down to form an extra check sample for the block from which it came. No sample should be rejected which has been properly taken, whether rich or poor in values. If rich simply as a check, two additional samples may be taken, one on either side of the suspicious sample, within 1 foot or 18 inches of the original. If high results are again obtained, the original sample should be allowed to stand as representative, but the two check samples are entered separately and marked "check."

Proceeding in this thorough and systematic manner, the engineer may ascertain almost exactly the value of the ore along the actually exposed portions of the mine workings.

It is when he attempts to generalize these carefully obtained results in estimating "ore in sight" that the greatest care and judgment must be exercised. The actual operation of veins for years in many regions has abundantly proven their vagaries, and indeed "things are not what they seem" in mines. When estimating ore beyond the range of actual vision—the ore that is still in the vein encased in its rock walls—the engineer can only be guided by two considerations—his experience elsewhere in veins of similar character and his intuitive judgment. He reasons that the ore lying at and about the center of a block or section of a vein, exposed on three or four sides, will probably partake, to a great extent, of the character of the vein where it is exposed in the workings. If these have shown the vein to be fairly regular in size and value, he is willing to admit the probability of the center of the block, if not too large, being of similar character; but if the actual workings have proven the vein to be erratic in both size and value, his natural inference is that the center of that particular block will not prove an exception, and found to be richer or more extensive than the portions of the vein already exposed. Even approximate estimates can not be ventured where the workings are long distances apart; but if levels be not over 75 to 100 feet apart and raises not over 60 to 100 feet apart, an estimate based on information obtained in the manner described is not likely to prove very misleading. In every examination of a large mine the values of the property, as determined by samples taken by hand and worked down mechanically and systematically for assay, should be proven by mill runs or shipments to reduction works, and previous shipments of ore, mill runs, samples and assays taken by others, etc., all have a bearing on the subject, and, where available, should be examined and given the consideration which they seem to deserve.

THAT granite is technically as well as actually mineral was decided by the United States Supreme Court on the 23d inst., in the case of the Northern Pacific Railroad vs. J. A. Soderberg. Defendant had been quarrying granite from a quarter section of land claimed by the railroad company, who sought to enjoin him. Defendant claimed the land to be mineral, and therefore reserved from the railroad grant. In this the Supreme Court agrees, holding that the land is mineral within the meaning of the law.

It is said that, unless the necessary native labor can be obtained, "it will be impossible to work the Rand mines to advantage," which simply means that the mine managers are unwilling to pay to white laborers a wage rate which would prove an inducement to them, for the reason that the mines can not afford the increased expense. Recently white labor has been in excess of native labor on the Rand owing to the great difficulty experienced in obtaining Kaffirs.

WITH copper between 13 and 14 cents there are large profits for most of the greater concerns, and also for many small ones. Moreover, that price is not prohibitory, and does not create unusual competition with other metals as substitutes for copper.

CONCENTRATES.

FIVE HUNDRED GRAMS OF OIL (1 1/2 pound) produce an energy of one mechanical horse-power. This would equal in continuous effect the efforts of twenty-one men.

A FRAMER is a machine which every mine timber shed could use where power is available. It is more economical than framing timbers by hand, and its work is as accurate.

"CRUSHED STEEL" is an artificial abrasiyo, used more particularly by stone cutters. One company in Pittsburg, Pa., produces nearly 700,000 pounds crushed steel annually.

THE laws of several mining States require that a code of signals shall be conspicuously posted at the station of each level in the mine as well as at the collar of the shaft and in the engine room.

IN the best coke the moisture should not exceed 1 1/2%; the volatile matter should not exceed 3 1/2%; the fixed carbon should be above 86%; the sulphur should not exceed .75%; the ash may range from 5% to 11%.

THE CALUMET & HECLA copper mine at Houghton, Michigan, has twenty-eight heads of steam stamps, with a daily crushing capacity of 8000 tons of ore. The copper occurs native in the rock and is recovered by concentration.

IN answer to a California inquiry, the laws of the State provide that a corporation may pay dividends to its stockholders from the net earnings of such corporation, but any dividends paid not obtained from net earnings are illegal.

A MACHINE DRILL may be mounted on timbers and used as a trip hammer in the blacksmith shop. Supplied with a suitable pestle, it is useful in pulverizing mine samples. Two pounds of rock can be pulverized to pass a 20 screen in about two or three minutes.

MINERALS can be determined by means of the blow pipe with certainty, but the process requires considerable technical knowledge and practical experience. Both hornblende and augite have distinct cleavage, but it is not usually observable without the aid of the microscope.

THE best indication for oil is a seepage of oil from an oil-bearing stratum, but such stratum is frequently not profitable to bore near its outcrop, as the volatile portion has usually long since passed off, and the residual material is more like bitumen or asphaltum, and will not flow readily.

CINNABAR usually occurs at or near the contact of sandstone and serpentine. This applies to all the large known deposits in the world, though there are numerous occurrences of cinnabar under other conditions, but they are of local importance, and have never been demonstrated to be of great value.

GREAT BRITAIN'S ANNUAL COAL YIELD is about 230,000,000 tons; that of the United States about 250,000,000. The annual coal yield of the entire world is about 750,000,000 tons. Russia is the largest annual producer of petroleum, about 10,000,000 tons; the United States second, about 8,000,000 tons.

THE presence of grit in crude oil can readily be detected by pouring a small quantity of the oil on a pane of window glass. Holding the glass at an angle, the oil will spread over the surface and the particles of grit, if present, will appear as more or less numerous specks on the sheet of glass, and can be plainly seen.

MANGANESE PIG or manganiferous iron is an ordinary iron made from ore containing somewhat more manganese than regular foundry iron, running from .8% to 3.5% in manganese, which neutralizes the effect of sulphur, removes excess of gas, and prevents blowholes. Spiegel iron is used mostly in steel making, containing from 3% to 20% manganese.

THE difference between German slow-burning powder and English black powder is mechanical and not chemical. In the English powder the ingredients are very finely ground, intimately mixed and pressed into one homogeneous mass. In the German powder the sulphur and charcoal are finely ground and intimately mixed, but the oxygen-bearing salt, the nitrate of potash, is distinctly granular.

THE price of water per miner's inch in California varies from 10 to 20 cents per twenty-four hour day. An inch as established by the Legislature of California is 1 1/2 cubic foot per minute. The amount of power that may be obtained from a given volume of water depends upon the height of the column of water (head) above the wheel from which the power is derived. If the power required is variable, and when little is being consumed, the pressure box overflows, build a reservoir or large tank to catch it. By this means a smaller quantity of

water—fewer miner's inches—may be made to accomplish the work, as when little power is being consumed the reservoir partially fills, and when the maximum power is required the additional amount of water is supplied by the reservoir.

CHALCOPYRITE and iron pyrites look alike and are near each other in specific gravity, so that it would be hard to detect either by its weight; but in hardness iron pyrites is away up, being 6, while chalcopyrite is 3.5 to 4. Thus, iron pyrites will scratch glass and easily scratch chalcopyrite, but chalcopyrite will make no mark whatever on iron pyrite. Graphite and molybdenite look and feel alike, both being equally soft, yet one can easily detect the molybdenite specimen, as its gravity is 4.7, while graphite is but 2.2.

A "WING DAM" does not extend entirely across a stream, but from one bank outward a greater or less distance, and thence along and parallel with the bank. In some cases the lower end is left open, and the water impounded behind the dam flows away owing to the grade. In other cases the lower end is closed and the water behind the dam is pumped or siphoned out. This leaves that portion of the bed of the stream comparatively dry, and it may be mined, or stone or other structures may be built on bedrock.

TWO OR MORE locators owning adjoining claims may unite their interests and perform all the assessment work on one of them, if it is apparent that the work thus performed is of advantage to all. But where two or more persons locate a single claim, and decide to divide it into equal parts, each owner to take a certain part of the claim, assessment work must then be done to the extent of \$100 on each part of the claim the same as though each fractional portion were a full claim. In this case there has been a severing of community interest and each parcel constitutes a separate claim.

THE percentage of gold that may be saved by amalgamation in a stamp mill depends upon so many things that it is impossible to even suggest a probable amount. In so-called "free milling" ores 80% of the gold actually free and susceptible to amalgamation by ordinary methods is a good saving—some do better—the escaping 20% yielding a considerable portion to subsequent concentration. In some California mills, where ore is worth \$12 to \$15 as it comes from the mine and sulphides worth \$125 per ton, tailings run \$1.25 or thereabouts. When the value of the ore is lower the tailings are correspondingly lower.

ROCK MASSES in close proximity to veins have a tendency to move, the direction of movement being determined by the line of least resistance. These rock masses are in wedge shape or in the form of lenses, and the unequal pressure results in forcing certain of these wedges from their natural position. The laws of gravity tend to make them fall into the slope of the mine, but the stulls or other timbers resist this, and as a result the rock moves laterally, along the course of the vein. To meet this stulls or sets may be put in at a slight angle to the direction of thrust and in a measure overcome this tendency.

THE hardness and weight of a mineral frequently aids in determining its character. A specimen of cuprite (red oxide of copper) weighs heavy, its gravity being 6. A specimen of cinnabar (mercury sulphide) is 8 in point of gravity. Both of these minerals often look alike, but the difference of two points in density—two points being easily noticeable—will determine the specimen's real character. Its hardness is another easy test. The cinnabar specimen is very soft—it is but 2 to 2.5; but the cuprite specimen is considerably harder, being 3.5 to 4—that is, cinnabar can be scratched with one's finger nail, while it takes the blade of a knife to make a scratch on cuprite.

THE black coating often found on nuggets of placer gold is due to iron or manganese, or both. This is deposited on the gold when the materials lying in the bed of the stream have ceased moving and become cemented slightly by iron and other substances. Such a coating would not form in a stream where upon the occurrence of a freshet the gravel and gold would move down stream. The abrasions to which the gold must necessarily be subjected under such conditions would quickly remove the film of iron from the nugget. Some nuggets that are bright will not amalgamate. These are usually covered with a film of silica or some other substance that cannot be seen without high magnifying power.

AT 100 pounds gauge pressure steam weighs .264 pound per cubic foot. In the case of a duplex direct-acting, triple-expansion engine, steam, when superheated 125° F., will do 16% more work than when saturated. With steam so superheated and the feed water passed through an exhaust heater, a given amount of fuel will produce 10% more work. The duty of a reheater is the sum of two distinct actions—the drying of wet steam and superheating of the steam thus dried. For the first, it must be competent to supply the amount of heat per unit weight. The area of heating surface and the temperature-head producing flow into the drying stream, as it passes into and through the reheater, must be sufficient to furnish this amount and also the quantity per unit weight re-

quired to insure the demanded superheat for each unit weight of steam flowing through the reheater. The use of perfectly dry steam and the elimination of condensed water would seem a very practical advantage of superheating. Water is a disturbing element in steam engines and steam pipes at all times. It increases the friction of the wearing surface, interferes with the lubrication, and chokes up the discharge; it produces unequal strains in the metal, due to different temperatures, and often gives leaks at joints which remain perfectly tight under dry steam.

SWELLING GROUND may be troublesome from only one side of the workings. In some drift mines this character of ground is often found in the bedrock, and then drifts or main gangways run in this rock prove expensive and difficult to maintain. In quartz mines, where the rocks swell upon being exposed to the atmosphere, either foot or hanging wall or both may swell, and sometimes also the vein material swells when the fissure is not composed of quartz. When this tendency to swell is noticed on all sides, it is almost impossible to keep the drift, shaft or other cutting open, and wherever possible it is more economical to abandon this development and make a lateral drift in the hard wall at a distance from the vein.

ANNUAL assessment work may be done on a patented claim, and may be applied to unpatented claims in the group if the work so done is for the actual benefit and development of the unpatented claim. The claims of the group must adjoin, and there must be no doubt of the character of the advantage derived by the unpatented claim in having the work done on the patented claim. Where this is done, or in any case where the work is done at a single point for the benefit of a group of claims, the burden of proof is on the owner to show that the work done, or improvement made, does, as a matter of fact, tend to the development of the property as a whole, and that such work is a part of the general scheme of improvement. This applies to either quartz or placer locations.

AS HAS heretofore been explained herein, it is impossible for "Concentrates" to give even an approximate idea of the cost of working a mine without a very comprehensive idea of all the conditions under which the mine must operate. These include geographical position, distance from railroad, cost of timber, water and power, topography, hardness of country rock and ore, size of vein, tunnel or shaft, dry or wet mine, and amount of water to handle, if any, wages of the district, character of ore and probable method of treatment. It is not an easy task to ascertain the cost of such operation when one visits a mine and makes personal inspection, and it is impossible to do so with no knowledge of the property and surroundings other than the size of vein and reported value of the ore.

THE idea of utilizing the flushing water instead of the boring rod for conveying motive power to the boring rod in rock drilling for deep holes has been put in practice in a hydraulic motor for such boring by Pruszkowski of Frankfort, Germany. The rods are either standstill or raised and lowered or turned, the actual boring being done by a hydraulic motor attached to the bottom of the rods, the water under pressure fed through the hollow rod to the motor, the escape water doing the flushing. In a drilling test with a drive pipe and piston 2 inches diameter, working pressure 170 pounds, the motor gave twelve strokes per second, consuming 1.1 gallons of water, the 8-inch bit drilling through extremely hard sandstone at the rate of 26 inches per hour; in soft sandstone at the rate of 23 feet per hour.

A COMPRESSED AIR haulage plant is and has been in operation at the Red Point drift mine, near Damascus, Placer county, Cal., for several years past. The motor operates under an initial pressure of 700 pounds per square inch. When first introduced the train was controlled on the outward trip by air brakes; but owing to the heavy grades, notwithstanding the numerous sharp reverse curves, it was found that it required as much air to control a train with this type of brake as was needed to pull the empty train into the mine, and the air brakes were discarded and hand brakes similar to the ordinary railway brake put in. These are manipulated by means of a stout, short stick to give greater leverage, in the hands of the trainmen. There is a relay station inside the mine several miles from the mouth of the tunnel, where the motor is recharged.

THE term "apex" or "top" of a vein, according to the Standard dictionary, means "highest point of a stratum, as a seam of coal." The Century dictionary says: "In geology, the top of an anticlinal fold of stratum. The term as used in the United States Revised Statutes has been the occasion of much litigation. It is supposed to mean something nearly equivalent to outcrop; but precisely in what it differs from outcrop has not been, neither does it seem capable of being, distinctly made out." Webster's dictionary defines it as "the tip, point or summit of anything." There are numerous other definitions, all more or less similar, but it will probably be a matter of dispute as long as the "extralateral" right forms a portion of the United States mining law. A good miners' definition would be: "The apex is the point from the foot wall to the hanging wall at the top of the lode nearest the surface."

Boring the Tundra of the Nome Gold Fields in Search of Gold.

Written for the MINING AND SCIENTIFIC PRESS by OTTO HALLA.

Since the discovery of gold on the Nome beach, this question was always open for discussion: "Does the tundra between the Bering sea and the hillsides contain gold in paying quantities?"

During the winter of 1899-1900 several shafts were commenced at the edge of the beach on the tundra, but owing to the frozen condition of the soil the work of picking the ground was very tedious, and wood too scarce to "burn down," the result was that in many instances work was abandoned before bedrock was reached.

In the winter of 1900-1 better conditions prevailed, a number of boilers being brought in during the rush of the stampede, and winter work, especially thawing, was done in a limited way, owing to the high price of coal. It was sold in the town of Nome that winter at \$75 or more per ton, the delivery to any claim would advance it about \$25 more, so that very few mine owners could avail themselves of the opportunity of working their claims that winter.

In many instances it was found, however, that there are places in the tundra not frozen, and those were found in the vicinity of growing willows. Some very good paying ground has been developed in those spots, so that it became the prevailing idea that the pay is found in the spots not frozen, or "open" spots. Invariably, however, when the shaft went to any depth, water was struck and the work had to be abandoned.

During the winter of 1901-2 more work was commenced in sinking shafts, this time under more favorable conditions—the coal at \$35 per ton and labor plentiful. Several shafts were dug to bedrock and the result was very satisfactory in proving that there are several layers of paying gravel, varying in thickness from 6 inches to 3 feet, and in some places as high as 20 feet of pay.

The depth differed in many localities from 65 to 120 feet to bedrock. The shafts were sunk at considerable distances apart, and any discovery of gold may, as far as could be told, have been only local, (for that particular claim). It was left to the boring machines to ascertain the true condition of the tundra in divers places. These have demonstrated beyond doubt that the deposits accumulated between the hillsides and the Bering sea contain large amounts of auriferous gravel, the value of which, computed by the cubic yard, reaches into the millions. An 8-inch oil well boring apparatus was used, the easy transportation of the machinery over the snow covered ground enabled the systematic prospecting of a large area of the tundra. It was found, as in the shafts, that several paystreaks varying in thickness overlay each other with a strata of clay, or muck, or in many instances beach sand between, the whole reaching to a depth of 65 to 120 and even 130 feet. It was conclusively proven that the same conditions prevail on the tundra as on the beach, which is, that the action of the sea has concentrated the gold in streaks parallel to the beach, varying in values at different depths.

The boring machine, of course, is only the forerunner of the actual work—the prospecting of the ground—the real work of which has to be done by sinking shafts and drifting on the different strata with thawers, the frozen condition of the ground making the work similar to quartz mining. The costs will be confined to thawing and hoisting of the pay gravel. Timbering can be entirely dispensed with, except in the "open" spots, which undoubtedly will necessitate pumping machinery to keep the shaft dry. The first condition of success to make the workings profitable is cheap coal. As long as the coal is sold in Nome at the extortionate price of \$35 to \$40 per ton, as at present, the development of the deep ground will be indefinitely retarded, and were it not for the experiments with the boring machines, there would have been up to the present time no light thrown upon the conditions of the tundra.

There is room for a hundred boring outfits in Nome. The work done by a few of these machines on the high benches of Dexter creek in prospecting to a depth of 120 feet is an immense saving of labor upon the old system of shaft sinking; moreover, the ground is being systematically prospected. An entire season's work is spent in many instances in sinking a shaft, for the purpose of testing the ground. If the result is negative, the ground is usually abandoned on the test of a single shaft, whereas the machine, by boring holes in two or three days, proves up the ground and indicates where a shaft can be sunk to obtain the best results. There is no need of waiting for winter season to prospect with boring apparatus. The past summer season's work was done on Anvil and Dexter benches uninterruptedly. But to bring them into general use, the price of coal must be much lower than it is now; with coal at \$15 to \$17.50 per ton, everybody could avail themselves of the opportunity to prospect, but at \$35 to \$40 per ton only mine owners who have prospected their ground can afford to work it during the winter season. There is an opportunity for enterprising men, with capital, to bore and prospect ground for

an interest in the claims, or to bore at so much per hole. Where miners individually could not afford to buy the entire outfit, many would be glad to pay for the prospecting of their claims.

The present winter season will add a great deal to our knowledge of the tundra and benches, as there is much work being done everywhere in the vicinity of Nome, but there is no question that the boring machine will be a great factor in the discovery and tracing of the strata of gold-bearing gravels in the Nome gold fields.

Nome, Alaska, Nov. 24, 1902.

Experiences of a Working Miner.

Written for the MINING AND SCIENTIFIC PRESS.

Very few mining engineers are "horn great." They usually have to work hard and for a long time before their services receive that substantial recognition which in these days is considered commensurate compensation for technical training and years of practical experience. An engineer of my acquaintance, who to-day occupies an enviable position in the mining world, tells this experience of the early days of his career:

"It was back in the early '80s. J— was operating and endeavoring to negotiate some 'hum' claims on P— Mt. He engaged me for \$50 to make surveys and plans of the claims—both surface and underground. I turned in my work, and old J— said:

"'But where's the report?'"

"'What report?'" says I.

"'Your report on the mines,'" says he.

"I had done all sorts of 'scrub' work, assaying, drafting, surveying, etc.; but no one so far had even hinted that my opinion of any mine was worth anything. My chest bulged out a few inches, but I managed to explain calmly that 'surveying' was one thing and 'mine examining' quite another. Evidently I convinced J—, for he told me to make the report and he would pay me 'whatever it was worth.' That was the report of my life. The mines did not admit of much, but I started in and curled up a little Earth from a nebulous toss-off of the solar system. I precipitated earth-making material and washed it with ages of rain. I stratified it, upheaved it, faulted and fissured it. I mineralized the fissures, and, finally, I got down to local conditions—the mountain backbone of the American continent—thence by gradations to the State of N—, where I described the great mining districts of the State, finally reaching E—; here I described the C— and R—; at last I crept up the trail to P— Mt., had my say about J—'s properties in about three paragraphs and the brain fog was over. Then came a day or two of corrections; finally a fair copy was made and handed to J—. I fancy there must have been fifty pages at least. J— read it over attentively and wrote out a check for \$55—\$50 for the survey and \$5 for the report. I did not appreciate the joke at the time and only thought that J— did not know any better. It did not dawn upon me that it was a fair estimate of 'what it was worth.'"

The L— W— Company bought a good prospect in A—, and, after developing it somewhat, decided that the mine justified reduction works of some kind; but it was a question what kind was most desirable. One director wanted a stamp mill; another had heard that rolls were superior to stamps; a third would listen to neither, but insisted on a smelter, urging that it cost less than a mill of equal capacity, required less water (and water was not abundant), and, as he was a man of force, he carried the day, and all the members of the board agreed that, after all, a smelter would be best, as it would turn out a high grade of product in quantity. A smelter was bought and set up and a man engaged to run it. This last party was an old smelter hand—had pushed slag pots, helped around a converter and knew the business from Alpha to Omega.

The ore was white quartz with iron sulphide and a little zinc or copper occasionally. The sulphides did not exceed 10%, but the values were fair. An experienced man would have recommended a stamp mill and concentrators as probably best suited to the conditions.

The smelter man could not manage the smelter, and finally admitted he was a "copper smelter, anyhow," and, on the advice of some friends, an experienced smelter superintendent was engaged. He visited the mine, examined the ore and said at once that a mill and not a smelter was wanted. The owners insisted on his trying the furnace. There were neither limestone nor iron within 50 miles of the place and coke was high—about \$25 per ton—and he did not even consent to attempt to run the furnace. After more discussion and getting advice (for which they paid), the loss of a year's time and with a second-hand smelter on hand, these mining men agreed, as they knew nothing of mining, to retire from the management and place a competent man in charge of the property. He promptly asked for \$30,000, which was placed in bank. A modern mill now stands on the mine, and a steady stream of hulkion is coming from the mill—all because of competent management.

The Theory of Misfires.*

In a discussion of a paper by E. H. Weiskopf, at a meeting of the Chemical and Metallurgical Society of South Africa, James Thomas said:

I have been going carefully through Mr. Weiskopf's paper in order to find the theory of misfires, as suggested by the title of his paper. The only suggestion of a "theory" that I can find, however, is that misfires are due, either to using too weak a detonator, or to the insensitiveness of the explosive.

In my experience, by far the greatest number of fires arise from:

- (1) Bad and cheap safety fuse.
- (2) Carelessness in handling safety fuse.
- (3) Carelessness in fixing on the detonators.
- (4) Detonators not cleaned out.
- (5) Low class detonator and insensitive explosive.
- (6) Carelessness generally.

(1) Cheap Fuse.—I have had twenty years' experience in the manufacture of safety fuse, and I know that a good reliable safety fuse cannot be sold in Johannesburg at the prices at which it is being offered by some firms and yet leave a profit.

It must be evident that to sell at such prices must either mean: 1. A quality less reliable than that manufactured under profitable conditions, which would naturally ensure greater care; 2. That manufacturers are sacrificing profit meanwhile in order to gain a footing for other goods.

Until some measures are enforced to secure a reliable quality, and so long as the percentage of misfires is not too great, the fuse will probably be considered by some as good enough. In my opinion this is a great mistake, for where men's lives are at stake nothing but that which is above suspicion should be used.

(2) Carelessness in handling the safety fuse.—Miners, as a rule, if they are going to charge any number of holes, cut the number of pieces of safety fuse into the lengths required, and then place them somewhere, until each in turn is wanted. Should, however, under these circumstances, the small column of powder at the ends touch the least damp, it will not convey sufficient fire to ignite the detonator.

(3) Carelessness in fixing the detonator on the fuse.—It is possible in wet ground for the outer layer of cotton to act as a channel to convey water into the cap. This has been known to be the case where proper care has not been taken against its possibility.

(4) Detonators not properly cleaned out.—This I have known to be the case many times; I had such an experience only a week or two ago. The detonator had passed through the hands of two miners, two holes were fired, but only one exploded, and on examination afterwards it was found that the detonator still contained sawdust.

(5) Low class detonator.—Sometimes, as pointed out by Mr. Weiskopf, the detonator is at fault. With detonators of the cheaper kinds, not uniform in strength, and with detonators too weak, also with insensitive explosives, misfires do, no doubt, sometimes occur, and I think that in the majority of cases partial misfires may be expected.

I am a believer in the old-time primer being used to assist in detonating the main body of the charge.

(6) Carelessness generally.—I am afraid that too often miners at work give little heed to what may be termed "little things," and a confession I often hear is: "Well, men will not take the trouble."

One of the greatest dangers that we have to guard against is, in my opinion, partial misfires, caused sometimes by badly incorporated mixtures; also in the case of blasting gelatine by too large a percentage of collodion cotton, and sometimes by the detonator being under charged. Thus parts of charges are left in the hole, and then attempts are made to deepen the holes, with the result that at the first blow an explosion occurs and those near are killed or injured.

Boring in old holes is responsible for by far the greater proportion of accidents with explosives that occur on the Rand.

Just a word as to the treatment recommended by Mr. Weiskopf of a man gassed by nitrous fumes. No doubt the treatment is theoretically good, but I may say that I know of a factory where a few drops of ammonia in water were given to men so gassed, and oxygen was inhaled for about five minutes, after which they completely recovered and returned to their work.

J. Watson, continuing the discussion, said: When a misfire has taken place, through what thickness of tamping or stemming, is it practicable to explode the original charge by inserting a fresh cartridge, with detonator, fuse and additional tamping?

Some three or four years ago I learned from a Transvaal mine manager that 14 inches of tamping is about the maximum amount through which the original charge can be exploded, and from my own experience I have no reason to doubt the accuracy of this statement.

The withdrawal, or unramming, of tamping from a hole which has missed fire is a dangerous operation; but by limiting the depth of tamping to 10, 12 or 14 inches (which is surely sufficient to give an effective

*Journal Chemical and Metallurgical Society, South Africa.

shot), it is a simple matter for the miner or prospector (who has had the misfortune to have a misfire), after waiting the regulation period of thirty minutes, to insert another cartridge and explode the original charge.

Practical Application of Dr. Black's Permanganate Process.

Written for the MINING AND SCIENTIFIC PRESS by
D. F. MEIKLEJOHN, E. M.

The recovery of gold remaining in tailings from the various chlorination works in California has long proven a vexing problem to the metallurgist. Many processes have been tried on this material with a view of recovering a portion of this gold, but without success.

The cyanide process has been tried by many experts, and several plants have been erected at the large dump at Sutter Creek in Amador county, Cal. None of these plants ever succeeded in making even a partial saving. The average value of these tailings, estimated from 100 samples taken from ten different dumps, is about \$9.60. The gold might be said to occur in four distinct forms: First, as free

of plant, price paid for the tailings, labor, etc., is less than \$2 per ton.

The plant used consists of one 500-gallon solution tank, two 5-ton leaching tanks, two 600-gallon precipitating tanks, and one copper tank filled with old iron. The leaching tanks are provided with the ordinary gravel filter bottoms, with a 3-inch space underneath. The leaching tanks are charged each with five tons of tailings, which are packed in as tightly as possible by walking around the inside circumference of the tank. This packing is one of the most necessary features of the process. When the tailings are packed tightly the replacement of one solution by another is absolute. The point when the solution ceases is as marked as when the first solution appears. After the charge in each tank is packed and leveled a wash solution, containing one-half ounce of sulphuric acid per gallon of water is carefully sprayed over the ore until the charge is wet for about 6 inches below the top, after which it is allowed to run on as rapidly as possible until each tank has received 500 gallons.

After the acid wash has disappeared 300 gallons of pure water are run through to complete the cleaning. The office of the wash water is to remove all traces of iron sulphate and as much copper as possible. The iron sulphate if not removed reacts on the solution, causing a destruction of the permanganate

twelve hours, the remainder will remain in suspension several days. In order to recover all the gold without a large filter bed, or great number of settling tanks, we use a saturated solution of barium chloride. After the solution has been thoroughly precipitated and allowed to stand quietly for eight hours, a gallon of the barium chloride solution is carefully sprayed over the top. The barium chloride reacts with free sulphuric acid in the solution, forming a dense white precipitate of barium sulphate, which settles rapidly, carrying with it all the fine suspended gold.

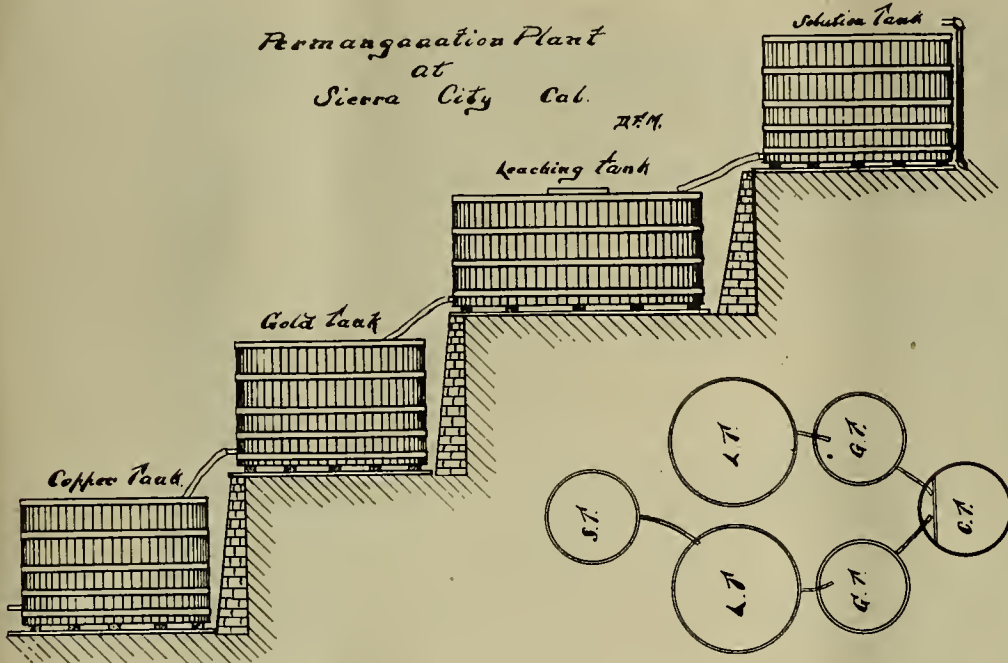
After the solutions receive the barium chloride treatment they are allowed to stand quietly for eight hours longer, and are then decanted by means of a floating hose into the copper tank through a charcoal filter. The copper tank is large and is filled with old iron, which removes most of the copper from the solution, and also recovers some gold. The overflow from this tank passes through another charcoal filter, passes over more iron in sluice boxes, and is then discarded.

The precipitation tanks are cleaned up every day, the precipitation transferred to a barrel, which is siphoned off from time to time, until the accumulation is large enough to warrant its being cleaned up. The accumulated precipitate is treated in the same manner as ordinary cyanide slimes, dried and melted.

The successful application of this process is dependent on extreme care, careful watching and thorough washing of the ore. Its use on sulphides carrying, besides the gold, a tolerably high percentage of copper, can be highly recommended. On high-grade sulphurets properly roasted I find it superior in many ways to other chlorination methods. It gives higher extraction at much lower cost, and without any suggestion of free chlorine in manipulation. The extraordinary simplicity of the method, its cheapness, its freedom from free gas and its possibilities should recommend it to all interested in modern leaching processes.

Sierra City, Cal., Feb. 20.

Permanganate Plant
at
Sierra City Cal.



gold very fine and light; second, gold that was once in chloride form, but which was not thoroughly washed out; third, gold encased in small, partially fused particles, due to imperfect roasting; fourth, gold intimately associated with iron oxide, probably in combination.

The gold that occurs in the first two forms is easily recovered, that in the third and fourth forms is lost in the tailings.

A small saving can be made by passing the tailings through a form of spitzkasten and concentrating the coarse lumps, which are usually rich enough for smelting.

In September, 1900, I began a series of experiments on chlorination tailings, working merely on the supposition that they would yield to some application of the cyanide process. I made many cyanide tests, all of which were failures so far as practical work was concerned. I spent two months in Denver, Colo., at one of the best laboratories there trying every known form of cyaniding, amalgamation or concentration, with negative results.

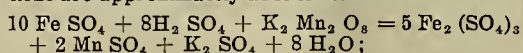
In April, 1901, there was published in the MINING AND SCIENTIFIC PRESS an article by H. Norman, describing "Prof. Black's Permanganate Process."

I was at once struck with the possibilities of this process, and arranged for a series of tests. The first few tests were failures, as I made the solution too strong. The first dilute solution I used gave 40% extraction. After about four months' work with this method I was able to extract and recover 50% of the gold remaining in chlorination tailings at a cost of about 30 cents a ton for chemicals.

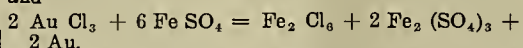
The recovery of the gold after it was in solution proved almost as difficult as getting it into solution. In all this work I was assisted by A. H. Stephens, an electrical engineer, who is also a thorough chemist. When we at last determined to make a practical trial of this process we purchased a small pile of chlorination tailings from the Sierra Buttes Co. at Sierra City, Cal., and a small cyanide plant. We arranged the cyanide plant to use the permanganate process as we had determined it, and began work in November, 1902. Up to the time of this writing we have run through 400 tons, which have yielded \$6.10 per ton.

The total cost of working, including chemicals, cost

and a partial precipitation of the gold. The reactions are approximately as follows:



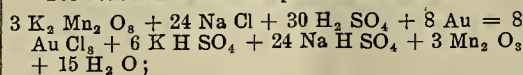
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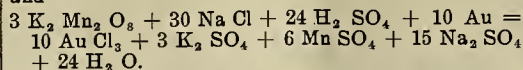
To hasten the washing of the ore a suction pump is used. The ordinary form of ejector answers very well where a good force of water is obtainable. After the ore in the tank has been dried with the vacuum pump it is again carefully packed around the edges and the leaching solution run on as rapidly as possible. This solution is made up as follows: $7\frac{1}{2}$ to 10 pounds crude sulphuric acid, 10 pounds common salt (Na Cl), 10 ounces of potassium permanganate to each 100 gallons of water, 100 gallons of solution being required to each ton of ore.

The solution started from the top of the charge appears in about seven hours at the bottom. And if the ore has been properly washed the solution has a faint pink tint and shows a slight amount of gold. As the color increases the amount of gold increases. The increase is gradual for about four hours, then falls off rapidly toward the last. The solution is given about ten hours contact.

*The reaction that takes place is as follows:



and—



After the solution appears below the charge it is conducted by hose to precipitating tanks, where it receives a strong solution of iron sulphate. When the precipitation of the gold is complete it is allowed to settle for eight hours.

The gold appears as a very fine purplish-black precipitate, which no amount of stirring will accumulate. The extreme fineness of this precipitate makes it difficult to collect. About 60% of it will settle out in

*Taken from MINING AND SCIENTIFIC PRESS, April 6, 1901.

The Depth of the Dolcoath Tin Mine.

The new Williams shaft of the Dolcoath tin mine at Camborne, Cornwall, commenced about seven years ago, would strike the main lode about 300 feet below the deepest working parts of the mine when sunk vertically 3000 feet. This shaft has been sunk half way, and sinking is being carried on at a speed of about 600 feet per year. The deepest working parts at present are about the sump and eastern shafts, where they are about 2400 feet vertically from the surface. The numbers attached to the levels are, perhaps, misleading to those unacquainted with the mine. The so-called 2400-foot level would be 2400 below the adit, measured on the incline of the lode. The adit is over 180 feet from the surface. This gives to the so-called 2400-foot level an inclined depth of over 2580 feet; but vertically measured it would be about 2100 feet from the surface, possibly rather less. Dolcoath is thus practically half a mile deep.—West Briton.

Open Trough Roller Pan Conveyor.

The accompanying illustration shows an endless open trough roller-pan conveyor for handling heavy ore from the bins to the crusher of the Colorado smelter of the Anaconda Copper M. Co., at Ana-



Open Trough Roller Pan Conveyor.

conda, Mont. This conveyor runs in front of a series of bins, from which the material is fed into it by means of special gates. The ore varies from small pieces up to lumps weighing 200 pounds or more.

The conveyor is about 150 feet long, and is constructed of a heavy Hercules chain, designed for heavy work, where gritty or abrasive material is handled. The chain is covered completely with over-

lapping pans, forming an endless open trough. The pans are made of steel, reinforced with oak planking, the latter designed to take the thrust of the pieces as they fall from the bin and the steel the abrasion from the ore. Every other pan at intervals of 2 feet is provided with a heavy steel axle and two 6-inch self-oiling flanged rollers. The conveyor is of heavy construction throughout. These conveyors are built of both light and heavy construction, of different capacities and length to meet local requirements, by the Jeffrey Manufacturing Co. of Columbus, Ohio, who will be pleased to give prices and particulars to any one interested.

Cyaniding Tests at Ely, Nevada.

To THE EDITOR:—A recent article, "Cyaniding Tests at the Chainman Mine, Nevada," contains some statements of a rather positive nature which the writer feels called upon to correct.

Had Mr. Janin, the author of the article, confined himself to the subject matter proper, no cause for dispute could have occurred.

The writer, whose services were obtained to put in operation the new mill of the Chainman Co., the one in question, wishes to give a short description of the method of treatment as finally adopted at the plant, and incidentally to correct an impression that must surely exist, and that places the then manager in a bad light.

To begin with, Mr. Janin quotes a number of tests, made during his sojourn in Ely, and under his personal supervision, on the ores of the Chainman mine.

All of these tests, without exception, so far as the writer knows, were made on extremely small lots of ore—say from five to fifteen assay tons. These tests, while of undoubted value as a preliminary to the large leaching tests, also to be carried out in the laboratory, have aside from this no practical value whatever, as they invariably give faulty results, both in extractions (generally high) and in percentage of cyanide consumption, likewise high. Especially is this true in the case of agitation tests.

The writer, on accepting the position of mill superintendent, was of course called upon to make a large number of metallurgical tests.

It required but a superficial examination to show that the method of treatment settled upon by the previous experimental tests was an impossible policy, based upon carefully prepared average samples obtained from the mine; and here, by the way, it seems essential to call attention to the careless practice, so often followed, of using the samples for determining tests that do not represent a fair mine average. Such a course invariably leads to disaster.

By experimental measurements and careful calculations, it was found that only a slight excess of water over that required to operate the mill on a wet crushing basis, as set forth in Mr. Janin's article, was to be had. All this water, by the way, had to be pumped from the mine shaft to a tank on the hill above the mill, at a heart-breaking expense for fuel and labor, as the pumps required a steam pressure of close to 100 pounds at the boilers, and almost constant attention during the entire twenty-four hours. Furthermore, this water was in such a condition chemically as to render it inadvisable to use it, at least without the use of some neutralizing agent, such as lime, which brings at this distance from the railroad (150 miles) the extreme price of \$26 per ton, and adding to the already high cost of the water another large item of expense.

The writer, therefore, profiting by the known fact that the ore had already been treated with fair success, by methods of dry crushing, a condition mentioned by Mr. Janin in his article, but overlooked by him in his experimental work, made a series of tests on lots of ore varying from five to sixty pounds.

It was the intention to carry out the tests at all meshes, from mine run to 40-mesh wire screen, but the first two tests, one at 1½ and the second at ½-inch mesh, gave results of such an encouraging nature that series of tests were run, meeting a condition similar to that of the first test, with uniformly excellent results.

It was found that without the use of a quantity of lime, at least four and one-half pounds per ton of ore, results showed a decided falling off, both in extraction and in consumption of cyanide.

To show the results of this scheme of treatment on a large scale it is only necessary to quote a few of the summaries on the tanks as operated on the mill. This treatment, by the way, closely resembles the mode of treatment as practiced at the old Mercur mill during the days of the Mercur oxidized zone.

The writer agrees with Mr. Janin, that the ore resembles a tufa, of a decomposed character, but thinks it was originally a sulphide ore, since oxidized and leached of its sulphates, deriving its values from below by ascending mineral solutions, which dissolved out the limestone along the line of contact of the porphyry dike with limestone and replacing the cavities with an ore deposit, and also impregnating the dike alongside. The reason for solution of the limestone along the line of the dike is explained by the alteration of the limestone caused by the intrusion of the dike itself, making it more susceptible by the percolating mineral waters.

There is not an indication of the iron having come from the limestone at any time, and its presence in

the dike in excess of the amount in the vein matter is easily explained by the fact that the dike is of much firmer material and less altered, and consequently less readily oxidized and leached.

The ore as brought from the mine was sent to the top of the mill by the inclined tram, run over a grizzly, set to 1½-inch spread, and the fines, sent direct to the leaching tanks; the balance, ore oversize, amounting to something like 15% of the total, was first passed through an Austin gyratory crusher, set to a 1-inch opening, and then also sent to the leaching tanks.

Here it was treated to a solution varying in strength from .2% for the strong solution, to .05% for the weak solution, five pounds of lime being added per ton of ore to the cars before passing the rock breaker, they thus being thoroughly mixed before coming to the leaching tanks.

The following results on a number of the first tanks treated are presented:

Tank No. 1—	Gold.
Heads.....	\$2 45
Tails.....	83
Tank No. 2—	
Heads.....	3 56
Tails.....	93
Time of treatment, 104 hours.	
Cyanide consumed, 106.5 pounds.	
Tons, 112.5.	
Tank No. 3—	
Heads.....	3 10
Tails.....	62
Time, 150 hours.	
Cyanide consumed, 95 pounds.	
Tank No. 4—	
Heads.....	2 48
Tails.....	83
Tons, 105.	
Time, 150 hours.	
Cyanide consumed, 100 pounds.	
Tank No. 5—	
Heads.....	2 48
Tails.....	83
Tons, 103.	
Time, 150 hours.	
Cyanide consumed, 100 pounds.	
Tank No. 6—	
Heads.....	4 13
Tails.....	93
Tons, 110.	
Time, 120 hours.	
Cyanide consumed, 105 pounds.	

I also quote from two tanks that were allowed to fall below the regular five pounds of lime per ton:

Tank No. 1—	Gold.
Heads.....	\$3 10
Tails.....	1 96
Tons, 107.	
Time, 160 hours.	
Cyanide consumed, 132 pounds.	
Lime, 320 pounds.	
Tank No. 2—	
Heads.....	3 93
Tails.....	2 27
Tons, 109.6.	
Time, 160 hours.	
Cyanide consumed, 155 pounds.	
Lime, 100 pounds.	

Mr. Janin makes the statement that under good management the plant should have been a partial success.

The writer acted merely as the metallurgist and mill superintendent, but he is at a loss to know how a success (he does not know what Mr. Janin means by a partial success) could be accomplished in the cyaniding of an ore that gave, not \$9, \$10 and \$12 per ton, but values of less than \$3.50, on a basis of fifty tons per day, 150 miles from a railroad with hauling rates at 1½ cents per pound, lime at \$26 per ton, and fuel high and scarce.

The writer does not wish to question, or detract from the ability of Mr. Janin in any respect, but feels compelled to alter any false impressions that might be derived from the mere reading of Mr. Janin's article.

There is one other thing that I wish to speak of before dropping the subject. Others may have noticed it, but if so I have never seen it given expression. It is that in many, if not in all, cases a tailings dump which has come from a cyanide plant can not be safely sampled over the surface.

The reason for this is that the action of the sun in drawing the dissolved values to the surface and then evaporating the moisture concentrates the values at that point. This would probably not be the case in the winter after the snow had been standing on a dump for any length of time, sufficiently long for the moisture to carry the values back into the dump and again distribute them, though it is extremely doubtful if even this would occur to any extent.

At any rate, in the majority of cases the dumps are sampled during those months when the other condition exists, and misleading and oftentimes extremely high results are obtained, sometimes causing serious trouble, both by the erection of plants for the purpose of retreatment, or, as is more often the case, injury to the men who originally operated the plant by permanently hurting their reputations, in a manner entirely undeserved.

WINTHROP H. WICKHAM.

Denver, Colo., Feb. 12.

Lead Refining at Trail, B. C.

For many years experiments have been in progress, with the hope of eliminating the fire process in the separation of the values and impurities in lead bullion. This process is hard on those engaged in the work, and the dangerous lead fumes make it impossible for men to continue their vocation longer than three or four years, lead poisoning invariably resulting. According to the Canadian Mining Review, A. G. Betts by his new process is producing electrolytic lead on a commercial scale at the Trail refinery.

The Betts process involves the dissolution of the lead in the bullion, or anode, and its precipitation upon a steel plate, or cathode, by electrolysis. Electrolysis may be defined as the course of chemical changes induced by the passage of a current of electricity through a chemical compound, in solution. The solution, or electrolyte, with the aid of the current, dissolves the lead in the anode and transfers it to the steel plate, leaving the impurities behind as a slime.

The plant consists of twenty-eight cedar vats, well joined, and lined with rubber composition. They are in four rows, seven to a row, and so placed that each vat is 3 inches lower than the one above, in order to permit of the better circulation of the solution. The current is furnished by two dynamos, running in parallel, generating 2000 amperes each, and conveyed to the vats by means of large copper bars. The vats are connected in series, so that the current passes from the first on through the twenty-eight, entering the solution in each vat through the anode and passing out through the cathode. To make the matter clearer, it may be well to state that the electrode by which the current enters the electrolyte is called an anode, and in this case is the base bullion, and that by which it leaves the electrolyte is called a cathode, which in this case is the steel plate.

After the lead ore is treated at the smelter, the resulting bullion, instead of being cast into bars, as it runs from the furnace, is moulded into anodes, 30x40 inches, and an inch in thickness. It is made into this form in order to provide a larger surface for the actions of the acid. These anodes weigh about 350 pounds, and contain, approximately, 3% of impurities, consisting of arsenic, antimony, iron, zinc, silver, gold, bismuth and cadmium. They are carried on a runway and lowered so as to hang perpendicularly in the electrolyte, which is a solution of lead salt. Twenty-two of these anodes are thus suspended, with a steel plate or cathode placed in like manner, between the anodes, at an equal distance of 2 inches. The selective action of the electrolyte dissolves the lead in the anode, and the current of electricity transfers it to the cathode, leaving the foreign substances in place on a mere skeleton or sheet of lead, which remains. The process by which the twenty-two anodes in each vat are dissolved requires about eight days, and in order that the action may be equal on the entire surface of each anode, the electrolyte is kept circulating from one vat to the other, and from the last vat it flows into a collecting tank, whence it is pumped back into each row, thereby maintaining a constant circulation of the solution. When the anodes are about spent, or eaten away by the action of the current, the cathodes are hoisted from the vats and a sheet of lead, 99.999% pure, is stripped from the steel plate and recast into bars for shipment to the manufacturer of lead products. The anodes are then transferred to a separate vat, where the impurities, which have remained as a muddy slime, are washed from the skeleton sheets of lead, which sheets are recast into anodes, to undergo the same process of refining. About 15% of the original anode remains unspent when the slimes are removed. The impurities, or slimes, are of such a nature that they cannot be economically treated on a small scale at Trail, and for the present are being dried, boxed and shipped to the United States, where values are separated and marketed.

The solution used as an electrolyte contains lead fluosilicate and fluosilicic acid. It is prepared at the works by the solution of quartz in hydrofluoric acid, with the subsequent addition of lead carbonate or white lead. The white lead dissolves, with effervescence, to lead fluosilicate. The solution answers very well for an electrolyte, for the lead fluosilicate is very soluble in water. The salt does not crystallize on the sides of the tanks and the solution has no odor, nor is it otherwise disagreeable.

Porcupines Destroying Trees.

To THE EDITOR:—I have made several trips in Montana—in many parts of Madison county, especially on the west fork of the Madison river. The first trip I made I could not help but notice how many pine trees had been killed by having the bark gnawed off. In many places the trees seem to have been nearly girdled. Upon inquiry as to the cause of this, I was told it was the moose which inhabited this vicinity, and from hunger during the winter would eat the bark of these trees; but, upon investigation, I found this was not the cause at all, but, instead, it was the porcupines.

I have seen acres of fine timber land almost entirely destroyed, and on two occasions I saw the porcupines on the trees. It was with surprise I

found out the injury done by these animals, and I fully believe that the State of Montana and other States could not do better than to offer a good bounty for the extermination of these forest-destroying porcupines.

C. O. BARTLETT.

Butte, Mont., Feb. 18.

Mine and Mill of the Ophir Consolidated Mines Co., San Miguel Co., Colo.

Written for the MINING AND SCIENTIFIC PRESS.

The Ophir Consolidated Mines Co., Ophir, San Miguel county, Colorado, is a corporation composed of Wisconsin and Michigan men. The financing of the company is in charge of J. O. Buckley, president, Milwaukee, Wis. The present operations are controlled at Ophir by W. S. Buckley, general manager; H. R. Buckley, assistant manager; J. McWilliams, mine superintendent; C. Nazro, metallurgist, and W. Major, mill superintendent.

The original claims of the company were the Silver Bell and Butler properties, fourteen claims, which they acquired in October, 1900. Up to that time the two properties had produced over \$500,000. There

hin. The ore passes through Challenge feeders to the stamps. From the stamps the pulp went to four Wilfley tables. The tailings from these were elevated by a spiral sand pump to a series of spitzkasten, and from there sent to eight Frue vanners. The crusher was driven by a 20 H. P., three-phase Westinghouse motor, and the hatteries driven by a 30 H. P., three-phase motor. The countershaft for these hatteries was placed below, using belt tighteners. The concentrators were driven by a 20 H. P. motor. In the spring and summer of 1902 the mill was enlarged (see Fig. 1) by the addition of thirty new 1000-pound stamps, batteries of chrome steel throughout, 12 feet of amalgam plates to each battery (see Fig. 2), twelve Frue vanners, a Rohin's belt conveyor 74 feet long with a traveling tripper (see Fig. 3), a sampler, sample conveyor, concentrates conveyor, etc. As the mill is now arranged the ore comes in over the tramway and on to the grizzlies as before, but the feeding floor at the crusher was changed to lessen the labor of feeding.

The ore falls on a belt conveyor which carries it to a Vezin sampler; thence the ore goes to an elevator, and then to the Rohin's belt conveyor, which deposits it in the bins. For the line shaft and lower countershafts was substituted a countershaft giving a horizontal drive to each battery, so arranged that the first battery was driven by a 20 H. P. motor driving

pidity and ease with which it may be carried on.

An auriferous cyanide solution, if made acid with sulphuric acid and hotted with finely divided, pulverulent metallic copper, will, within a short time, deposit its gold content on the copper. Any silver in the solution is also precipitated. If this mixture is now filtered, the filter and contents may at once be subjected to a crucible assay treatment, and its lead buttons cupelled and determined.

If, instead of taking cement copper, or metallic copper powder, a solution of bluestone is used after acidification, and a few small pieces of sheet aluminum are added, and the solution hotted until all the copper has come down, the result as to the precipitation of gold and silver is the same. This modification takes more time and attention in boiling. If aluminum has been used, it should go into the crucible with the filter and its contents. Commercial cement copper is particularly fitted for this test, because the acid, in taking up any basic iron or copper salts of the cement copper, renders the copper as finely divided as it is customary to obtain it in the sluice boxes of "copper leachers." The finer and the more pulverulent the copper is, the greater is its surface and the more energetic the precipitation, thus permitting a minimum amount of copper to be used.

In applying the method, I use, as a rule, 250 c.c.



Fig. 3—Belt Conveyor, Ophir Mill, San Miguel County, Colo.

have since been purchases made by the company until it now owns eighty-two claims, millsites and water rights, all the property lying between the Cariheau on the east and the Butterfly-Terrible on the west, five claims in width. There are five known veins which traverse the property from east to west, nearly $2\frac{1}{2}$ miles, viz: The Silver Bell, Butler, Venticle, No Name and Ida. The latter is a pure gold-bearing vein which runs \$10 and upward. The other veins are large and run in gold, silver and lead, not refractory. The property is located on what is known as Yellow mountain. The sixth level crosscut has approximately a back of 900 feet, and it is estimated that it would take a 100-stamp mill years to work it out. They have a four-drill compressor plant, three drills being run at a distance of 4000 feet from the compressor and 1000 above it, with an average consumption of one ton of coal daily. Machine drills are used for development work, and also in stoping. As a result of two years' work, the company has at this time over 2 miles of levels on ore. Up to date the mine and buildings have cost \$375,000. The property is producing about \$35,000 per month. The mill is situated on the Rio Grande Southern Ry. at Ophir Loop.

This mill, as originally built in 1901, was composed of twenty 1000-pound stamps, with concentrators. The mill contained two 4x8-foot grizzlies, which received the ore from the tramway. The fines from these grizzlies dropped into the ore bin, the oversize going to a 9x15-inch Blake crusher, thence to the

to a countershaft with a Hill clutch-pulley. The other four hatteries are driven in the same manner, excepting that the hatteries are driven in pairs by a 50 H. P. motor to each pair. The horizontal drive to stamp hatteries is illustrated in this mill, where almost all vibration is eliminated with less wear on the cam shaft bearings. The addition of three Hallett classifiers and two Dimmick classifiers have added much to the efficiency of the mill. The concentrates are dumped into a hopper depositing onto a belt conveyor, which elevates them into a bin from which they can be drawn by gravity to the wagons. The mill lies within 100 yards of the railroad station, on level ground, so that tracks can be extended to the mill. The machinery for the mill was furnished by the Mine & Smelter Supply Co. of Denver and the new mill was designed by H. P. Saunders, engineer with the Mine & Smelter Supply Co. L. Felton, of the San Juan, erected the mill.

Test for Precious Metals in Cyanide Solutions.*

By ALBERT ARENTS, Alameda.

This test is based upon the fact that metallic copper will precipitate gold and silver upon its surface from acid solutions. Of course, the fact is not new, but its application is probably so. I have used the method with success; it recommends itself by the ra-

of the solution to be tested; add a few c.c. of sulphuric acid; agitate for several seconds, and then add not less (although not much more) than 1 gram of cement copper. Now follows heating to boiling. This is kept up for about ten minutes, so that the rising steam bubbles keep the mixture well agitated. The mixture is then filtered through a 7-inch-diameter gray filter paper. No washing is done. As soon as the filtering is finished one-third of a crucible charge of flux is added to the filter containing all the sediment of the mixture. Some of the moisture is rapidly absorbed by the flux, which permits the folding of the filter's rim upon the charge and its subsequent removal without loss or tearing. One-third of a crucible charge of flux having previously been placed upon the bottom of the crucible which is to be used for melting, the filter is transferred to the crucible, well tucked down, and the last one-third of the crucible charge is placed on top of the filter in the crucible. It is then ready for the furnace. The filter itself furnishes the reducing agent for the assay. I use 30 grams litharge and the usual amount of borax and soda, employing a No. F crucible for melting. About 20 grams of lead are obtained. The lead button comes out bright and clean, and upon cupelling furnishes a head free from copper.

Possibly this method of testing for gold and silver may be used upon other solutions than cyanide; also, for solutions from testing metallic copper for precious metals, when the solutions do not contain nitric acid in any form.

*Trans. Amer. Inst. Min. Eng.

Transportation at the Grand Central Mine, at Robinson, Utah.

Written for the MINING AND SCIENTIFIC PRESS.

The aerial tramway recently installed at the Grand Central mine at Robinson, Juab county, Utah, shows some new features of construction. Herewith are given several illustrations of this tramway. Figure 1 shows the upper or loading terminal. A 200-ton ore bin is located on the left, next to the shaft house, and the buildings are so located that the ore is trammed only 30 feet from the cage. The floor of this terminal was kept as low as possible to avoid having to raise the head-sheaves of the hoist.

Fig. 2 shows coal hopper and belt conveyor. At the upper terminal there is a coal hopper and belt for conveying coal to the boiler-room. When coal is being brought up an extra man is required, who dumps the buckets into the hopper as they pass him without detaching the buckets or delaying the operation of the tramway. When running full capacity the tramway develops sufficient power to allow every bucket

to be loaded with coal, when ten tons of coal can be delivered into the hopper per hour.

Fig. 3 shows support No. 4, located on the end of a span of about 1000 feet, where the line crosses a deep gully near the mine. This support is built of Oregon fir, the six main posts being 8x8 inches. The ties and diagonal bracing is 3x8 inches, and saddle supports and caps are 4x8 inches and 4x10 inches. This type of support is a radical departure from the usual type of tapering-tower construction with a saddle support across the top. It requires about 25% more material to build a support in this way, but the structure is much stiffer and the trusses are taken care of in a much more economical manner. The legs of this style of support can be cut to fit any kind of surface, and the cost of anchoring them securely is reduced to a minimum. This support is 35 feet high on the low side, and it carries the weight of the long span when the tramway is running loaded on both lines with ore and coal, without showing any signs of weakness.

Fig. 4 gives a view of supports No. 7 and No. 8, which are constructed in the same manner as the higher supports. No. 8 was roofed in to avoid possible contact between the high tension electrical power line which crosses the tramway line at this point.

Fig. 5 shows the lower terminal of the tramway. The railway tracks are in a cut below the surface on the opposite side from view point. The terminal structure is built on top of ore bins that have a storage capacity of 300 tons, which is separated into three 100-ton pockets. The elevated part of the terminal in the rear is the coal elevator.

The coal is unloaded from cars into a bin that has a storage capacity of about three cars. The elevator conveys the coal to a small pocket in the terminal, and it is delivered into the tramway buckets by gravity. The internal arrangements in this terminal for dumping the ore buckets and reloading them with coal is very simple, and when the tramway is not running at a higher speed than twenty tons per hour one man can easily do the work. A new feature about this terminal is the way the side stresses on the ore bins, due to the tension of the cables, are taken care of. Two heavy guys are passed back from the cable anchorages in this terminal to ground anchors, and attached thereto with turnbuckles so that the ore bins are relieved of side strains and have only to bear the working strains due to the loading and unloading of the ore. The material used in all the supports and terminals of the tramway is Oregon fir.

Fig. 6 shows the 5 cubic-foot Bleichert bucket with the friction grip and automatic attacher used on this tramway. There are thirty-two of these buckets in use on this line and they are spaced 324 feet. When the line is operated at the comparatively low speed of 350 feet per minute, it will deliver

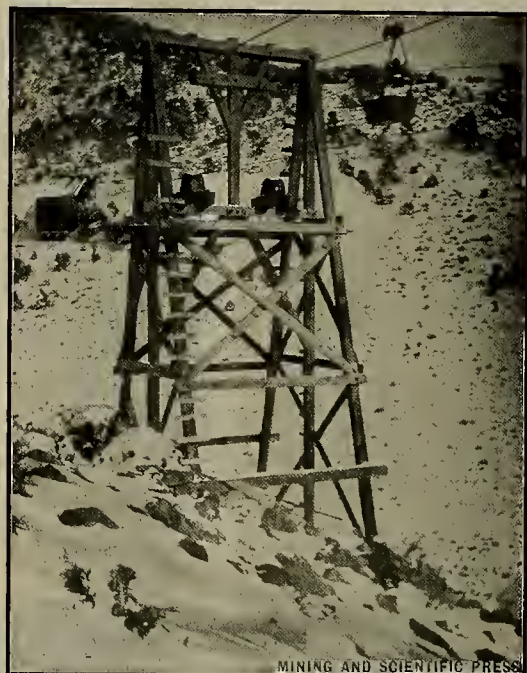


Fig. 3—Support No. 4, Lower End of Long Span.



Fig. 4—Supports Nos. 7 and 8, the Latter With Roof.

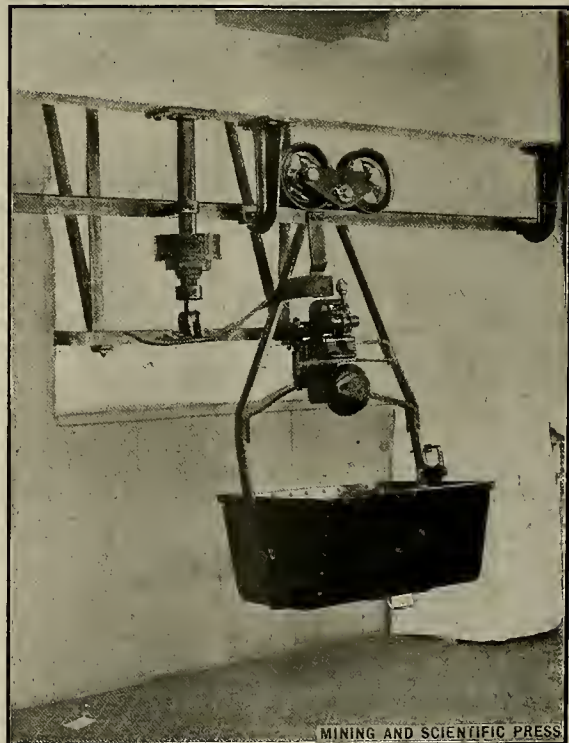


Fig. 6—Bucket 5 Cubic Feet, With Friction Grip and Automatic Attacher.



Fig. 1—Loading Terminal and Ore Bins.

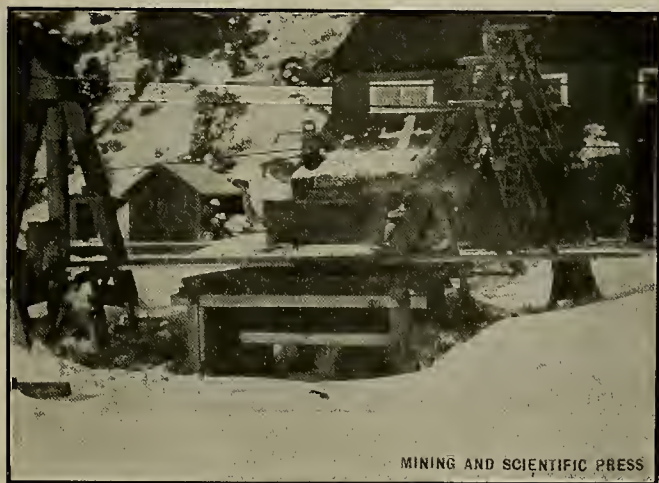


Fig. 2—Coal Pockets and Belt Conveyors Near Loading Terminal.



Fig. 5—Discharge Terminal.

twenty tons of ore per hour. The new features about this bucket, recently installed for the first time in the territory tributary to Salt Lake City, are the improved grip and automatic attacher. The most commendable feature about these improvements is the comparatively easy way of attaching the buckets to the traction rope. The bucket is attached while it is in motion and will always grip the rope with the grip-lever in the proper position for locking the grip securely, without depending on any muscular effort on the part of the operators other than required to push the bucket into position for gripping the running rope. The shock and necessary slippings in the grip—unavoidable in the old method of snapping the grip down on the rope by hand—is almost entirely done away with in this improvement. Another feature is the absence of the flat spring that passed from the back of the grip and over the top to hold the grip open when detached from the running rope. A round wire, placed on the inside of the grip and giving better service, takes the place of the flat wire.

The difference in the elevation of the loading and discharging terminals is 791 feet, the length of the line is 4575 feet, and when running at the rate of twenty tons per hour develops power enough to carry up ten tons per hour without reducing the speed. When not carrying back freight, all the power developed is absorbed by double brakes in the upper terminal. The standing cables are the locked-coil kind and are connected up in 1000 foot lengths with steel couplings. The cable on the loaded side is 1½-inch diameter, and on the light side 1 inch. The traction rope is ¾-inch diameter and is of the special seven-wire lang lay cast steel kind, made specially for the service demanded in tramway operations.

This tramway was designed for the Grand Central M. Co., and all the material furnished by the Trenton Iron Co., of Trenton, N. J.

Electrolytic Reduction of Lead.

On the subject of the electrolytic reduction of lead, Pedro G. Salom read a very interesting paper at the recent Philadelphia meeting of the American Electrochemical Society. He described the process invented by him and in use by the Electrical Lead Reduction Co. at Niagara Falls. The ores that are reduced are sulphides of lead. They are used as cathodes in an acid electrolyte. The hydrogen ions combine with the sulphur of the ore and form hydrogen sulphide, which escapes as gas, while the lead sulphide is reduced to lead. This is the principle of the process. The apparatus used resembles in a general way a pile of dinner dishes of lead, piled one above the other. Each of these dishes represents a cell, the under side of a "dish" being the anode of the lower cell, the upper side the cathode of the upper cell. With forty-eight cells in series they use 130 volts and get two pounds of lead per horse-power hour.

The lead obtained in this process is in spongy form, and is then used for making other materials, like litharge. Owing to its spongy form the lead is very readily transformed into litharge. Samples of spongy lead, compressed lead, litharge and other materials were shown. In future it is also intended to make accumulator plates.

The principal difficulty in the practical operation of the process was that the reduction was not complete, and that under apparently identical conditions the degree of reduction was not the same, especially as lumps of ore in the immediate neighborhood of the cathode plates were not reduced.

In the discussion which followed, the following explanation of this fact was offered: When the electrol-

At present they have succeeded in improving the reduction so that about 92% to 95% of the lead sulphide is reduced to lead. Another difficulty experienced was that the workmen's eyes were effected during the operation by the escaping gases; but this difficulty appears to have been overcome.

As the developed gases are hydrogen sulphide and oxygen, in their combining proportions, it has been proposed to utilize them in gas engines, which then could develop more power than was used in the process. This apparent paradox was explained by Prof. J. W. Richards in the discussion.

The ores treated in the process contained no silver. No attempt is therefore made to refine the lead for producing silver.—Journal Franklin Institute.

Subway Railroad Construction, Oakland, Cal.

Written for the MINING AND SCIENTIFIC PRESS

Preparations for the new ferry system between Oakland and San Francisco, Cal., by the S. F. O. & S. J. Ry. Co. necessitated crossing the right of way of the S. P. Co. at Yerba Buena avenue, near Emeryville station, Oakland, Alameda county, Cal. To solve this problem a subway is being constructed. The tracks of the S. P. Co. for several miles run parallel with the bay shore, hence the problem of constructing a subway, one-half of which is under tide water, may be deemed of sufficient interest to warrant a description of the method pursued. The subway proper—that portion immediately beneath

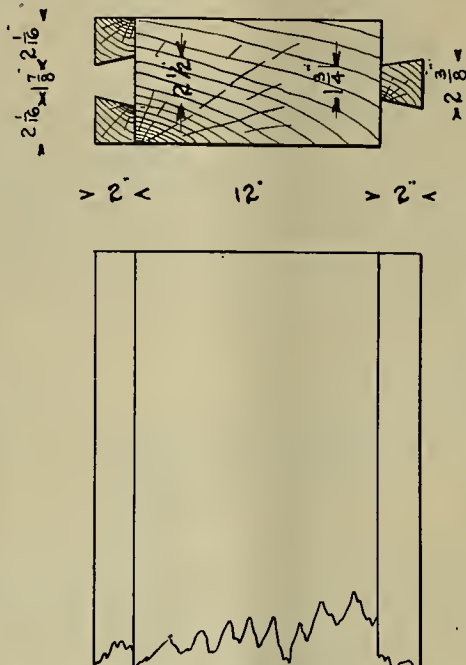


Fig. 1—Sheet Piling, Railroad Subway, Oakland, Cal.

the S. P. Co. tracks—is 100 feet long and 18 feet deep, the surface of the concrete in the bottom of the cut being 12 feet below "high water line" and 6 feet below low water. The conduit is 28 feet wide inside on the bottom, allowing space for double tracks. The approaches on either side are 500 feet in length, giving a grade of 3.6%. The bay approach is from the pier, which extends 16,000 feet to deep

(These piles are not to be cut off till the concrete is sufficiently set to hold the posts for the false work.) The tracks of the S. P. Co. will be carried across the subway on a steel plate girder structure, with the ties set in cement in a "steel trough floor."

To build up the concrete sides of the bay end of the conduit, the first step was to drive a row of sheet piling on either side as an outer wall. At the deeper portion 6x12 inch pine was used, and the remainder 4x12-inch. These were made tongue and groove by spiking on strips (see Fig. 1). They were driven into the hardpan to insure a water-tight compartment; and each pile has a double row of 3-inch wrought-iron spikes driven into same, and projecting 1 inch to serve as an anchor for the concrete. The concrete used in the sides and bottom of the conduit will be mixed in the proportions: 20 cubic feet crushed rock, 5 cubic feet sand, 1 barrel cement, the excavation being kept dry during the building up of the concrete by a pumping plant. The bottoms and sides of the conduit are strengthened with old railroad rails laid in the concrete, both longitudinally and transversely (see cut)—those on the bottom lapping 6 inches, and fastened to the cap (2 inch shim between) with railroad spikes. The transverse rails were bent to extend from the bottom up the sides. The concrete on the bottom has sidewalk finish. The walls are to be capped with granite levelers, and the outer sides protected with hand-laid rock, as shown in section. The work is progressing rapidly. All the sheet piling at the bay end has been driven, and the actual work of excavation is about to begin at that end. Meantime the piles are being driven in the soft alluvial at the land end. The work of preparation has now been in progress several months. Fig. 2 represents a vertical cross section of the conduit as it will appear when completed. It shows the details of construction and was taken from the working plans of the engineer in charge of the work, H. C. Holmes of San Francisco, Cal.

Ore Dressing Laboratory at Columbia University.

Laboratory work grows in favor all the time in all kinds of scientific instruction. Text-books are of undoubted value, but the student finds an experiment performed by himself far more impressive than any amount of instruction in words, however clearly presented.

In schools of mining engineering one of the great difficulties which has been met in teaching ore dressing by the laboratory method has been the difficulty of keeping full-sized concentrators in continuous operation for several hours. For example, if a ton of pulp is available for practice work by the students, in a comparatively few minutes it has passed over the vanner, and before the student has had time to really begin the adjustments of the machine he is confronted with the task of pulp shoveling and transportation.

If the student visits mills in full operation he may watch and study machinery in perfect adjustment, but he gains no knowledge of how to make the adjustments that are necessary whenever a new plant is installed.

To make continuous running of full-sized machines possible, H. S. Munroe of Columbia University, New York, has designed an effective laboratory plant. After the crushed ore has been treated on jigs, vanners, tables, hydraulic classifiers and the like, it passes down into a sub-basement, where it enters one of the ordinary mechanical feeding machines, which serves not only as an automatic feeder, but as a small supply reservoir. The material is thence fed into a centrifugal pump, which elevates it back to the upper floor, at the same time thoroughly mixing it. Thus with half a

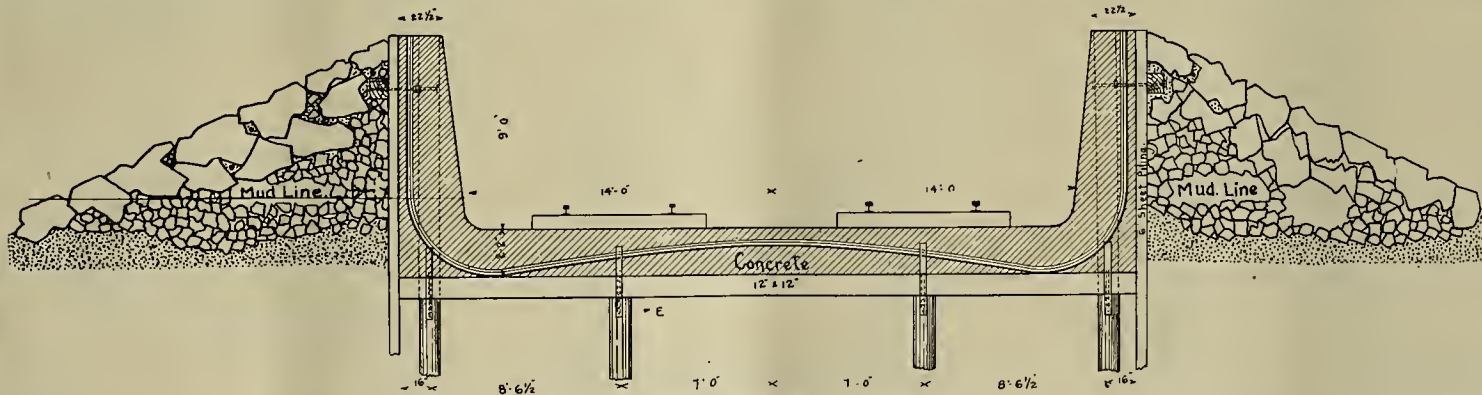


Fig. 2—Cross-Section Railroad Subway, Oakland, Cal.

ysis begins, the parts of the ore near the electrolyte are reduced; when the electrolysis progresses the current may prefer to pass through the reduced lead to the cathode, hydrogen being developed and no lead sulphide being reduced. According to this view, the efficiency of the reduction would gradually diminish with progressing electrolysis. This would explain the fact that especially lumps of ore remote from the electrolyte are not reduced.

water, where are to be located the ferry slips and depot. In constructing this approach eucalyptus piles were driven to the hardpan, in bents, 8 feet center to center, cut off at the proper grade. On these, fastened with drift bolts, were placed caps of 12x12-inch pine. From each pile an anchor bolt extends up into the concrete. The piles in the subway proper have caps made up of two pieces, 4x18-inch girder planks, let into the piles their full depth.

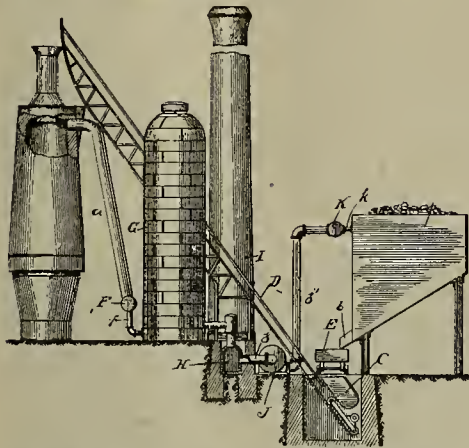
ton or so of crushed ore any ore classifier may be kept running continuously without attention for any desired length of time. The students first learn the principles underlying ore dressing in a laboratory provided with small tables, glass hydraulic classifiers, etc., that is, they here learn the science of ore dressing. Then, passing into the large ore dressing laboratory, they learn the art of adjusting and handling full-sized classifiers.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 17, 1903.

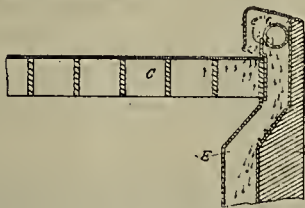
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

FURNACE APPARATUS.—No. 720,125; F. H. Foote and T. W. Robinson, Chicago, Ill.



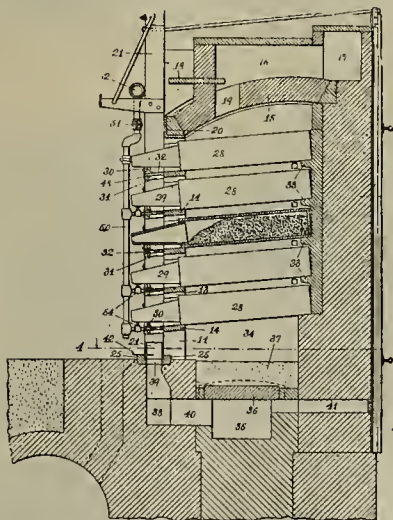
Combination of furnace, ore bin associated with furnace, conveyor constructed and arranged to receive ore from bin and convey same to top of furnace, stove associated with furnace, an offtake flue connected and arranged to conduct combustible gases from top of furnace to lower portion of stove, heating jacket for bin, and connecting flues and passages for conveying products of combustion from stove to jacket.

ORE DISCHARGE FOR JIG TANKS.—No. 720,564; G. T. Cooley, Joplin, Mo.



Combination in ore discharge for jig tanks of compartment extended across discharge end of grate open to upward currents of water through grate, and open at forward bottom edge adjacent to grate for admission of separated ore; barrier in compartment extending across grate and of height equal to desired normal thickness of bed; hutch having mouth full width of discharge compartment and communicating with compartment behind barrier; rotatable pipe mounted in mouth of hutch beyond barrier and partially cut away longitudinally full width of mouth; bottom of hutch sloping toward outside of tank, and faucet adapted to discharge water and ore from hutch.

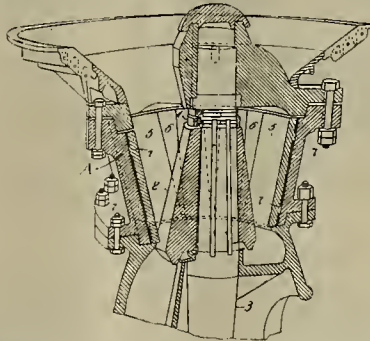
ZINC SMELTING FURNACE.—No. 720,664; J. P. Cappeau, Joplin, Mo.



Combination with zinc smelting furnace, series of air pipes arranged at intervals at front of furnace, main air passage adjacent to lower ends of air pipes, communicating with them, and open at its ends to outer air, discharge ports in air pipes communicating with interior of furnace adjacent to retorts, gas pipes arranged adjacent to discharge ports, and

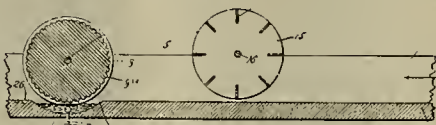
means for conveying gas to pipes, whereby air and gas are conveyed and distributed at numerous intervals to furnace adjacent to retorts.

CONCAVE FOR ROCK CRUSHERS.—No. 720,853; J. D. Spargo and G. W. Rose, Doble, Cal.



Combination in rock crusher of shell and separable concaved or grinding surfaces, concaves or surfaces having parallel side edges, and locking keys between adjacent concaves and tapering from one end to other.

AMALGAMATOR.—No. 720,883; O. H. Burden and T. F. Adams, Kaslo, Canada.



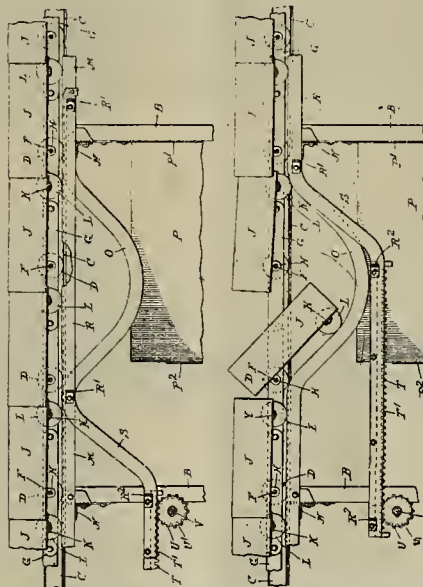
Amalgamator, comprising sluiceway having amalgam reservoir, ore attenuating mechanism situated in sluiceway having revoluble members of different sizes disposed in co-operative relation to each other, and means for driving larger of revoluble members at peripheral speed exceeding rate of flow of water and auriferous material through sluiceway.

AUTOMATIC ORE LOADER.—No. 720,960; T. M. Park, Darrington, Wash.



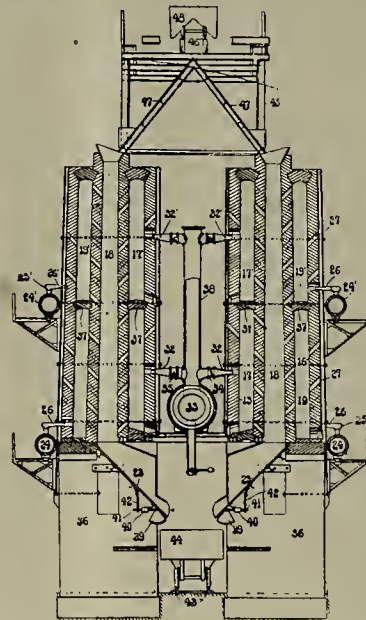
Combination in loading apparatus of tiltable frame, support therefor, sprocket wheels turnable on axes vertical to bottom of trough in which conveyor operates, endless conveyor traveling about sprockets, conveyor having blades adapted to sweep up load at lower end of frame and to discharge load at upper end thereof.

DUMP GATE FOR ENDLESS TROUGH CARRIERS.—No. 720,963; J. Petersen, Chicago, Ill., assignor to the Link Belt Machinery Co., Chicago, Ill.



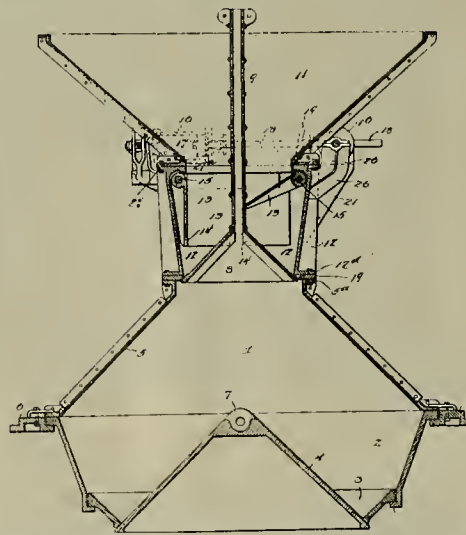
In trough carrier, combination of permanent track on which is supported one end of each carrier section, with second permanent track having movable sections on which the other end of each carrier section is supported in varying positions at will of operator, both tracks being normally in same plane, and movable track sections being adapted to be moved longitudinally.

ORE ROASTER.—No. 720,969; F. C. Roberts, Philadelphia, Pa.



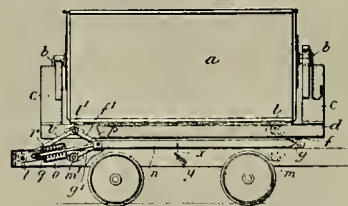
An ore roasting furnace, consisting of two parallel rectangular structures separated by space, each structure containing series of independent roasting chambers, series of independent combustion chambers and series of independent waste product chambers therefor, chutes for delivering ore to roasting chambers, railway construction for delivery of ore to chutes, second railway in space, and chutes leading roasted ore from roasting chambers to cars on second railway.

FURNACE CHARGING, CONTROLLING AND DISTRIBUTING MECHANISM.—No. 721,088; E. Ramsay and J. J. Shannon, Birmingham, Ala.



In charging structure for metallurgical furnace, combination with main charging hopper structure of distributing box surmounting same, pivotally supported valves or plates in box, and mechanism for swinging valves separately toward center of box to divert material to different parts of hopper, whereby furnace charge may be distributed uniformly in furnace.

SPRING FOR VEHICLES.—No. 721,107; T. G. Stevens, Gravesend, England.



In wheeled vehicle, combination with main frame e, of the horizontal carrying frame d, toggle levers f, g, f', g', pivoted together by pivot spindles, and to carrying frame and main frame by spindles l, l', m, m', toggle levers being all of equal length, body a, mounted on frame d, connecting rod connecting spindles h, i, spring o, rod connecting spindles h, i, with spring, spring box r in which rod can slide, connection between box and main frame, connection between spindle i, and main frame, pointer carried by movable part of mechanism, and scale over which pointer can travel.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

E. McCannell of Dawson has bought the J. A. Kelsey and S. Parker groups of claims on White Gulch, in the Nizina district, at the head of Chititu.

ARIZONA.

COCHISE COUNTY.

The Copper Glance M. Co., near Bisbee, will put in two 200 H. P. boilers and a pumping plant, the pumps to raise 1,000,000 gallons of water per twenty-four hours.

The El Paso Herald says the Grand Reef mine, owned by the J. W. Mackay estate and located 60 miles north of Willcox, has 12,000 feet of work done on it and that C. Mackay will put up a concentrating plant this spring on the property. The ore carries lead and silver.

The Calumet & Arizona mine reports producing 1,600,000 pounds of fine copper, exclusive of the by-products of gold and silver, for January, with only one stack in commission. The superintendent says the output consisted of 750 tons of blister copper, 99% pure, and 75 tons of matte, 55% pure, besides the by-products. The second furnace was blown in this week and a third will be next month.

The Calumet & Arizona Co., at the Douglas smelter, in December produced 826 tons of copper from a single 250-ton furnace; in January the total output was 837 tons. There were two shut downs during the month. The average of the Calumet is said to be 14%. Additional 300-ton furnaces are being built which are expected to raise the capacity to 125 tons of fine copper daily.

GILA COUNTY.

H. J. Sisty, M. Hotz and M. J. Murphy & Co. will open up the Sultan group of gold mines, near Globe. The incline sunk on the Badger, down 120 feet, will be sunk to 450 feet.

The Old Dominion M. Co. at Globe is planning an outlay of \$400,000 to be used in sinking a new shaft to a depth of 1200 feet and in building a smelting plant and concentrating mill. The smelter will have four furnaces, and a capacity of 1200 tons of ore per day. With these improvements the company estimates it can produce 20,000,000 pounds of copper annually.

GRAHAM COUNTY.

(Special Correspondence).—C. C. Early, J. C. Burnett, J. E. Caplinger et al. have been negotiating the purchase of the Con. Gold Mountain M. Co.'s mines. The new company propose to develop the mines and place machinery on the property. Late development at the mine has opened up new ore bodies which carry gold values in addition to the main ledge, which is 50 feet wide. P. W. Fleming, of Tucson, is secretary. The Gold Mountain property is reported to have produced \$100,000 and has about 2500 feet of development.

Tucson, Feb. 19.

The Arizona Copper Co., near Clifton, has extended its railroad above the Shannon mine and is building additional bins for ore which will be hauled from its Mammoth mine.

MARICOPA COUNTY.

F. Jaeger, president Model M. Co., near Wickenburg, says he will install a complete system of ore roasters, and ten stamps will be added to the 10-stamp mill.

MOHAVE COUNTY.

(Special Correspondence).—The Gold Road mine of the Gold Road M. & D. Co., O. P. Posey president and manager and C. A. Stephens superintendent, is 25 miles from Kingman and about the same distance from Needles. Within two years the company has spent \$125,000 in development and paid for the property. They have blocked out 125,000 tons of gold ore. One vein is 13½ feet and one 16 feet wide in two stopes, and in a third stope is 12 feet. The lower level will average \$25 per ton. They are now installing new hoisting engine, electric pumping plant, etc. Are also retimbering the shaft. The company has built 4 miles of roadway. They are building a 150-ton cyanide mill, which they expect to have completed in ninety days. The power will be supplied by thirteen gasoline engines from 25 to 34 H. P. each; two dynamos for lighting. The water for milling comes from the mine and a pumping plant 4 miles distant.

The Sunbail mine, near Gold Road, is employing a number of men on development work.

The Leland, ½ mile beyond the Snowball, is operated by the Mohave G. M. Co. of Needles, Cal. J. Seward is manager. The tunnel on the Leland No. 2 is in 600

feet, with 30 feet of crosscut. They have a second tunnel in 300 feet. They have a total of eleven claims, eight of them in one group. Ore is free milling. This company will erect a mill.

The Lorona mine adjoins the Leland on the south. A shaft is down 25 feet on 10 inches of high-grade ore, which is shipped. A vein of low-grade ore, which is 3½ feet wide, averages \$12.50. Carl Tanner is manager.

About 4 miles north of the Leland and Snowball is the Silver Creek camp, where the Hardy mine has been worked intermittently for the past forty years. It is now being operated by the Gold Creek M. Co. of Acme, and 2500 feet of work has been done on the property; one shaft is down 225 feet and two 40 feet each; the balance is tunnel work. The company expects to erect a mill. I. W. Hawkins is manager.

The Homestake group of three claims on Silver creek has a shaft and tunnel. The vein is traceable for 2 miles and will average 20 feet wide. R. J. Holmes is the owner.

North of the Homestake is the Yellow Aster, owned by R. E. Zuver. Development is being pushed. They have a good water supply at the Silver Creek or Holmes camp. G. Krauss of Acme is developing the Good Luck mine, near the Holmes.

One of the first claims located in Mohave county, about 2 miles north of the Holmes, is the Moss mine, owned by Burlock & Snyder of Acme. The ledge is nearly 200 feet across. They have run onto an ore shoot 4 feet wide that averages \$21.

Acme, Feb. 22.

(Special Correspondence).—The Night Hawk at Loyna Springs has a tunnel in 1400 feet, which has cut the vein 600 feet in depth. They are cleaning out the tunnel to resume mining.

The Fortunatus mine at Loyna Springs, owned by Dennis & Coffery, has one shaft down 50 feet and another 20 feet. The ore runs three ounces in gold, fifteen to fifty ounces in silver, 30% lead. The Alpha & Omega, owned by the same parties, has a tunnel 300 feet, a shaft connecting with the tunnel 110 feet from the surface. They have a winze 90 feet below the tunnel level.

Kingman, Feb. 23.

(Special Correspondence).—Cerberat, 14 miles north of Kingman, is one of the oldest mining camps in Mohave county. A dozen properties have changed hands there the past two weeks. It is reported that E. T. Loy of Chloride has bought the Cerbat mine and intends reopening it. Denver men have also bought mines in the district and will develop them.

The Frontier G. M. Co., E. F. Holliday, Redlands, Cal., manager, has started work on the Nevada No. 2, Tom, Gusher and Frontier. The work is being done by contract. The Nevada No. 2, down 100 feet, shows a large body of sulphide ore. On each of the other properties they will sink 100 feet deeper.

The Idaho, owned by E. F. Thompson, is down 110 feet and shows \$15 to \$25 ore.

On the Vanderbilt Thompson & Beecher have a shaft 109 feet. Drifting south, they struck 18 inches of ore that will average four ounces gold.

The Golden Gem, owned by the C. O. D. Co., at Stockton Hill, has a shaft 326 feet deep. Drifts run 400 feet north and 150 feet south. The shipping ore averages five ounces in gold, milling ore \$25 per ton. Eight tons concentrate into one. They intend building a concentrating mill. Stockton Hill, Feb. 24.

A half interest in the Ruby group of gold mines, in Greenwood district, 2 miles from the Sandy, was sold last week to J. A. Marshall, of Hackberry.

The Frontier Exploration Co. has incorporated.—J. H. Bohon, E. F. Holliday, E. S. Graham, H. H. Durfee, H. B. Ely, of Redlands, Cal.—to operate near Cerbat.

The Hoffman Co., working the Samoan mine, east of Chloride, are shipping ore to the smelter. The mine is near the top of Sherum's Peak and the ore has to be packed several miles on the burros. It is proposed to build a smelter at Chloride.

PIMA COUNTY.

At the Reward copper mine, near Casa Grande, Superintendent W. P. Guthridge has forty men at work and a 30-ton smelter in operation. The hullion is hauled to Casa Grande for rail transportation. There are twenty claims in the group.

YAVAPAI COUNTY.

(Special Correspondence).—At the Sultana mine, near Hillside station, the new stamp mill and cyanide plant are nearing completion; C. E. Bunker, constructing engineer, and H. La Montague, general manager.

Hillside, Feb. 20.

(Special Correspondence).—The Octave G. M. Co., located at Octave, 10 miles

from the railway, has fifteen claims. Their two working shafts are each about 1200 feet deep, and sinking. The vein averages from 3 to 6 feet in width. Ore is partially free milling. They are crushing 135 tons in a 40-stamp mill. Process, amalgamation, concentration and cyaniding tailings. The mill has been in operation about three years. Air drills are in use and 175 men employed; A. E. Hurley, superintendent.

Octave, Feb. 20.

(Special Correspondence).—The Senate Gold Co., operating the Lucky Day, near the Congress, is down 500 feet, with drifts at the first, second and third levels, on each side from 50 to 150 feet, and body of ore that averages from 4 to 10 feet wide. At the 500-foot level are crosscutting. Ore runs from \$20 to \$25 per ton in gold and is concentrated; J. W. Akers, superintendent.

Congress, Feb. 21.

(Special Correspondence).—The onyx deposits on Big Bug, owned by the Arizona Onyx Co., cover about 285 acres. The company owns 180 acres of this. The onyx (aragonite) is the result of deposit from ancient calcareous springs in the vicinity, the deposit filling the valley several hundred feet across. At the base the aragonite rests on a conglomerate. It occurs in bands of varying width, from the fraction of an inch to a foot or more, the largest and most massive strata being apple green. The quarries have been idle for some time, but it is reported that work is to be resumed.

Mayer, Feb. 22.

(Special Correspondence).—The Bunker Hill Gold Mining Co., operating the Bunker Hill group near Prescott, in the Big Bug district, have a shaft down 100 feet, with high grade pay streak in the hanging wall, 20 inches to 3 feet wide. They are also driving a tunnel at a depth of 700 feet below the shaft.

McCabe, Feb. 24.

The Black Diamond C. M. Co. plant, in the Dragoon mountains near Pearce, is ready for operation and 1000 tons of coke has been contracted for. The company proposes to sink a shaft to a depth of 1000 feet, to strike the sulphide zone. While the Black Diamond Co. has gained a depth of 700 feet in its lower tunnel, below the apex of the outcrop, they say the ledge matter is still an oxide of iron.

The tramway at the Iron King mine, near Jerome, is completed and the machinery for the smelter is being placed.

CALIFORNIA.

AMADOR COUNTY.

Superintendent C. R. Downs of the Bunker Hill mine, near Amador City, reports the mine development as satisfactory. A good vein of pay rock is opened on the 800 level, and a large vein on the 1400. A drift is being run from the shaft to cut this vein on the 1200. He confirms the report that the company will build a 20-stamp mill. The mine is idle at present owing to washout of the Standard Electric Company's ditch.

The tunnel being driven west in the Hoffman mine, near Jackson, is in 460 feet, and in greenstone. One shift of two men are at work, and during January a distance of 70 feet was made, the average cost per foot being \$2.50, says Superintendent J. B. Francis.

BUTTE COUNTY.

W. P. Lynch has bought the Spring Valley mine, at Cherokee. Since hydraulicking was stopped by law it has been worked in a small way under lease. Several months ago the water rights were sold to the Bay Counties Power Co., and work practically stopped. It is reported that the Concow reservoir and water right goes with the property. This will furnish water to run the mine by drifting.

I. Meyer has filed a water right location on Feather river, appropriating 140,000 inches of water, to be taken from the river 6 miles above Oroville, for generating electrical power.

CALAVERAS COUNTY.

It is reported work will be resumed on the Cherokee mine, north of Angels, by San Francisco men.

Manager Morgan of the Sultana M. Co. at Angels says operations will begin by April 1 on an addition of twenty stamps to their mill.

DEL NORTE COUNTY.

J. S. Crawford of Philadelphia, Pa., F. H. Osgood of Seattle, Wash., and associates propose to install a smelter at their Cleopatra copper mines on Diamond creek, near Smith creek, just south of the Oregon line. They will build a railroad from their properties to the coast, 28 miles in length, and will have its terminus at Cable Harbor, Curry county, Or., where they own thirty-five acres frontage.

EL DORADO COUNTY.

Operations at the Baltic mine, Grizzly Flat, will be resumed under bond to a Colorado company.

The Eureka Slate Co., near Placerville, are preparing to put in an aerial tramway 2½ miles long. Water will be the motive power.

A. B. Gould, superintendent of the El Dorado Water Co., has men drifting on their Texas Hill Gravel mine, east of Placerville, and says they struck gravel last week in an upraise.

Neilsen Bros. have bonded the Meder quartz mine, near Grass Valley. They are crushing ten tons per day in a 2-stamp mill.

INYO COUNTY.

The Western Borax Co., W. H. Rees, superintendent, is increasing its working capacity in Saline valley, putting in additional tanks, etc. Two more teams have been put on the road, transporting borax to the railroad at Alvord. They are shipping a carload a week.

KERN COUNTY.

In Kern river field, near Bakersfield, the Monte Cristo Oil Co. has its wells, Nos. 38 and 49, down 700 feet and No. 50 down 50 feet.

The Associated Oil Co. has increased its loading track at the Kern river field to a capacity of fifty cars.

The Alameda Oil Co., near the Diamond at Sunset, has begun work on well No. 2, the derrick is up for No. 3, and lumber on the ground for No. 4.

The Lucky Boy Oil Co. has bought the southeast quarter of section 31 at Sunset from the Pittsburgh Co.

At Randsburg the Butte hill is still attracting attention, \$100 ore being mined in the Butte property, and a new strike of good ore is reported in the Wedge fraction, adjoining it.

LOS ANGELES COUNTY.

A strike of ore is reported in the New York mine, 2 miles from Acton. The ore from this mine and others in the vicinity is a fine grained sugar quartz with finely disseminated sulphurets. The average of ore crushed at the New York, Red Rover and Topeka mines is reported to have been \$12 per ton in gold.

MARIPOSA COUNTY.

H. Soderberg, superintendent Diana group of mines near Bower Cave, near Coulterville, says they will put in a 10-stamp mill. There are seven claims in the group being developed and a body of free-milling gold ore has been opened up.

At the Organita mine, near Mariposa, a gasoline hoist is being put in, the mill is being overhauled and operations will resume next week, says Superintendent R. Dodds.

NEVADA COUNTY.

Superintendent Culp of the Perrin mine, near Grass Valley, says a mill will be built, grading for which will begin next week. The property is being worked by a New York company, of which G. W. Root is president.

C. Puscheck, owner of the Mountain Maid mine, located 12 miles from Nevada City on the Bear river, reports the inclined shaft down 300 feet. Two years ago a new air compressor and machine drills were put in. They have been replaced by a larger compressor and drills. Twenty men are employed and the mill is running steadily.

The Federal Loan mine in Willow valley, near Nevada City, is being unwatered by the Gold Tunnel Co., preparatory to reopening.

PLACER COUNTY.

It is reported the Gold Blossom quartz mine, on Crater hill, in Ophir district, 3 miles from Auburn, will resume next month. R. H. Lloyd of San Francisco is manager.

Manager F. B. Jackson, of Sacramento, says he will work the Fowler & Gallagher placer claims on the American river near Colfax with a dredger, to be installed this spring.

It is reported the Charonnot & Lindley drift mine at Canada Hill, northeast of Westville, is bonded to J. F. Littlefield of San Francisco. A tunnel has been started.

T. H. Wilkins, president the California mine at Shady Run, east of Dutch Flat, says he is putting up a 10-stamp mill at Shady Run, and will crush the quartz and wash the gravel of the mine in the summer.

R. A. Watson, superintendent of the Shady Run mine, near Blue Canyon, says five stamps will be added to their mill equipment.

It is reported the Centennial (Shurtleff) mine, near Ophir, will resume next week. P. L. Lozano, J. L. Grimes and San Francisco men are interested.

SAN BERNARDINO COUNTY.

(Special Correspondence).—Unusual ac-

tivity is noticeable in the vicinity of Oro Grande. In this district are gold, silver, copper and zinc prospects and mines. The carbonate mine is the most extensively developed property in the district. It produces lead-silver ore, associated with limonite and manganese. A shoot of rich gold rock was discovered in the mine some years ago and subsequently lost. This shoot was from an inch or two to nearly a foot in thickness and consisted almost wholly of calcite, with occasional stains of iron and manganese, with a little quartz. Gold could be seen in the greater part of it.

A mile and a half east of Oro Grande are several copper prospects on which considerable development has been done in a superficial way. Half a mile to the northward from the copper mines, lead and zinc ores with silver are found. Nearer Oro Grande station is a large deposit of ferruginous quartzite, which may contain gold, but which has never been prospected. Geologically, this quartzite is identical with that at Gold Mountain, 40 miles east of this place. The latter is known to be gold-bearing and is owned and operated by J. R. DeLamar.

Oro Grande, Feb. 23.

The Copper Chief mine, 8 miles from Victor, is having machinery installed by the new owners.

SAN DIEGO COUNTY.

At the Picacho mines, owned by the California King G. M. Co. of Picacho, 30 miles north of Yuma, 300 tons of ore are being handled daily, but this spring their milling capacity will be doubled. An open cut, 53 feet deep, across a ledge is the present ore supply. The ledge is 160 feet wide, all of which is sent to the mill. Its assays average \$4 in gold, and the ore can be quarried for 10 cents per ton, says Superintendent E. Gee. It can be taken out, crushed and leached for less than \$1 per ton. It is crushed to twenty mesh and cyanided, by which 90% of the values are saved. In addition to the vein now being cut through, two others are being exploited, one of average value of \$5 per ton, the other 20 feet wide and \$6 per ton. On this latter vein a shaft is down 200 feet. They have 120 men at work.

The High Peak and Washington mines, near Julian, have a few miners at work on free milling ore. Some rich ore was recently taken from the Washington mine, twenty ounces of which gave \$3.60.

O. Welburn, who has a bond on the Ranchita mine, near Banner, is clearing out the shaft and levels to make an examination. This mine has produced some rich ore, but has not been worked steadily for several years.

It is reported that the Free Coinage group of mines, near the Noble property at Pine Valley, have been bought by Marr & Middagh of Colorado Springs, Colo. The veins in this district are usually small, but carry high values. They are fissure veins and lens-like sheets in micascist.

SANTA BARBARA COUNTY.

A rotary jig has been installed on the property of the Western Union Oil Co. at Careaga.

The Union Oil Co. of Lompoc has struck oil in its well on the Purisima ranch at a depth of 2000 feet and the oil is within 100 feet of the top of the pipe. They have decided to continue drilling, as the shale formation continues.

SHASTA COUNTY.

The Sam Houston M. Co., will resume operations on the Sam Houston mine in Old Diggings district, near Redding. F. P. Poor of San Francisco is superintendent and part owner.

The ledge of the Lone Jack mine of the Enterprise group, near Redding, is showing 9 feet wide and averages \$10 per ton. The lower tunnel, in 1200 feet, is in the pay chute, which was abandoned in the upper workings two years ago on account of water and lack of pumping facilities. In the Enterprise mine of this group Day Bros. are driving a tunnel in the lower workings. It is expected the mill will be in operation by March 1st.

J. E. Lewis of the executive board of the Western Federation of Miners returned to Keswick last week, and at a meeting of Keswick union a motion to renew the strike was defeated by a vote of 55 to 41. One furnace at the Keswick smelter was in operation, and Manager Wright says he can keep it running without union men, and when desired will blow in more furnaces. There are 150 men in and about the smelter who did not walk out when the recent strike was called.

H. G. Scrivener, with W. T. Wickes and O. B. Sherman, owning the Pawnee group of claims on Wild Cat, 3 miles from Bear Valley station, near Redding, reports an 18-foot ledge of \$20 ore opened.

W. W. Adams, superintendent of the Balaklala mine, has contracted for material and supplies for the new offices to

replace the building destroyed by fire some weeks since.

Judgment has been rendered in favor of A. J. Cook in an action involving the possession of the Enright smelting plant on North Cow creek, near Furnaceville.

SISKIYOU COUNTY.

H. Grayson, who bought the Punch Creek quartz mine on Humbug, near Yreka, is rigging up a water wheel for power to run pumping machinery. A 10-stamp mill is to be erected, and will be operated by power from the Siskiyou Electric Power Co., now extending wires from their plant at Fall Creek, Klamath river.

Work is in progress at the Spengler Bros. placer claim at mouth of Humbug. They are building a new reservoir and replacing new sluice boxes washed out during the heavy rain storms.

S. Gardner of Scott Valley has bought a three-eighths interest in the Eastlick Bros' hydraulic mine at Oro Fino. The claim is being worked. There is abundance of water for operating the giants and elevators until late in the summer.

Manager G. Rymal of Yreka reports having struck a ledge of pay quartz at Anderson Ferry on north side of Klamath river, owned by W. H. Jones of Chicago, Ill. The ledge is 4 feet wide; several tunnels have been driven and a mill will be erected.

The Jillson quartz mine, near Hornbrook, will resume, says Superintendent C. B. Jillson.

A. J. Ball of Rollins, operating on Methodist creek, southwest of Sawyer's Bar, is driving tunnels on his mine and in the spring will put in machinery to work the ore already blocked out.

F. W. Mahler, superintendent of the Deadwood hydraulic mine, near Yreka, has resumed operations, as there is an abundance of water, and with the snow from 4 to 6 feet deep Mahler says the mine is assured of water to keep running until next fall.

SONOMA COUNTY.

J. L. Cramer of Petaluma reports having opened up a 12-foot ledge of gold ore, assaying \$12, in the Cramer mine, near Glen Ellen.

TRINITY COUNTY.

Superintendent G. Lowden of the Three Peaks quartz mine on Battle creek, in Coffee Creek district, near Carville, says he is building a mill on the property, and the ledge being developed has widened to 8 feet.

F. and G. Lowden of Lowden's Ranch are developing a quartz ledge which they located on Saw Mill gulch, near Grass Valley creek. They have a 3-foot ledge of good ore.

The La Grange Co. contemplates building a large reservoir on the divide above the mine. It is reported that the large pipe which was laid by the Sweepstake Co. has been bought and will be tapped in a suitable place and used to pipe out the site of the reservoir. For 1 mile back the bank is cracked, necessitating the removal of the present reservoir. The construction of a new reservoir will admit of working the entire west side of the mountain.

The Lappin mine, near Deadwood, has been bonded by its owners to J. J. Chambers & Co., of Redding, Cal., for \$100,000.

The Homestake group, owned by Reed & Given, near Trinity Center, have shut down for the winter. This group lies half a mile up the mountain opposite the Enterprise mill. A tunnel has been run on the vein 150 feet, between walls of porphyry and slate. The vein runs from 8 inches to 5 feet in width, and carries free gold and sulphurets. A 60-foot shaft has been sunk on the vein.

At the Evans Bar claim, near Douglas City, three giants are being operated. C. Carr has a lease on the mine, which has an 18-foot bank of gravel.

TUOLUMNE COUNTY.

Fifty men are at work at the Republican mine, Jacksonville, and twenty stamps are dropping in the mill.

At the Mobian mine, near Groveland, Superintendent F. Chappellet is cutting a station at 500 feet in, in Tunnel No. 1, for an underground hoist, to have a capacity of 2000 feet. This hoist will be run by compressed air. Tunnel No. 1 is on the mill level.

The shaft at the Campo Seco mine, near Jamestown, is down 130 feet. Of this the first 60 feet was a two-compartment shaft, below which point the shaft was enlarged to three compartments. It will be made three compartments throughout by raising from 60 feet to the surface. Superintendent Hall says a large steam hoisting plant will be put in soon, and the gasoline hoist now in use at this mine will be removed to the company's mine at Nigger hill, half a mile southwest of Jamestown, where Superintendent Pinney is sinking a shaft for prospecting the vein.

S. Ball and W. Divoll, working the Hahapoo mine, north of Columbia, report

having struck a pocket last week, valued at \$7000.

A. T. Barlow of Columbia has bought a one-quarter interest in the Oklahoma and Arizona quartz mines, on the south fork of the Stanislaus. F. B. Price has bought the Salamander quartz mine, near Columbia. The McAlpine G. M. Co. has bought the Big Joe and Little Ben quartz mines. The Mountain King M. Co. have bought the Victoria Extension and Mountain King mines, near Confidence.

COLORADO.

BOULDER COUNTY.

The Valley Forge mine at Boulder, owned by Colorado Springs men, last week sent out a shipment containing three grades of ore which returned first grade, 31.20 ounces gold per ton; the second grade, 9.20 ounces per ton, and the third, 3.01 ounces. The vein is 7 feet wide and the ore shoot has been proved up for 90 feet.

The United States G. M. Co. has incorporated to operate a group of mines below the Fourth of July mine, near Eldora. A tunnel is being driven to open up the ledge at 1700 feet and a depth of 1000 feet. A complete plant of machinery will be put up in the spring. J. F. Rowell, of Eldora, is manager.

CLEAR CREEK COUNTY.

The 160 H. P. boiler and compressor on the Terrible mine of the Elkins M. & M. Co., near Silver Plume, are in operation and the shaft is being unwatered, which is expected to reach the 15th level by April 1st. The main shaft will be retimbered. Operations on the mill are being rushed.

The Hazleton M. Co. will begin operations on the Baltimore and other lodes, near Silver Plume, and the plans include the erection of a plant of machinery for driving the tunnel sinking the shaft and exploring ground, and the construction of a concentrating mill.

In the Penzance, near Freeland, in excavating for the compressor power house, another vein was cut at the surface, showing 5 feet of ore running \$4 per ton. The shaft is on the south side of the gulch, where a hoisting plant has been placed. At 100 feet a crosscut was started and is 45 feet to the west. Another 65 feet is expected to bring it to the new vein. Manager T. S. O'Neil has bought the Allan mill and will have it in operation by March 15.

The Freeland Con. M. Co., of Idaho Springs, has bought the Turner, Anchor and Falu mines near Freeland, and on the line of the Monarch tunnel. G. McClelland is manager.

The plant of machinery at the Terrible mine, near Georgetown, is in operation. The workings are being unwatered and by the time they are ready to break ore the mill will be completed.

The Nevada Con. G. M. & M. Co. made a shipment of 100 tons to the Rocky Mountain concentrator at Black Hawk last week. Development work is carried on at the Lamberson and Warren mines of the company's group on Kling flats, west of Nevadaville.

Arrangements are being made by Denver men to lease the Pay Rock mill, near Silver Plume, which will be used for concentrating ore from the upper Mendota dumps, and other zinciferous ores. The machinery will be overhauled. J. Thomas will have charge of the mill.

The Santiago, in East Argentine district, has struck ore which assays 20½ ounces of gold per ton and 2270 ounces of silver. The shipments from the mine have shown gold values for some time.

Haggart & Co. took a lease in 1900 to drive the 1000-foot level west to cut the ore body of the Aliunde mine at greater depth. In June ore was found on that level, and since shipments have been regularly made, the ore being high grade. This lease alone has produced \$90,000, with considerable ground yet to be worked out. In January the output was \$7000, and last week a shipment of 40 tons yielded \$8000, the first class running 740 ounces silver and 50% lead per ton, and the second class 286 ounces silver and 10% lead.

J. Cousins, working the Crazy Girl mine, at Freeland, reports having opened 12 inches of smelting ore in the adit level. With it is a streak of milling ore. It is the intention to continue drifting on the ore body and sink the shaft on the shoot.

DOLORES COUNTY.

E. Flene of Dunton says he will resume work on his mines in Navajo basin this spring, and will build a mill in the basin this summer.

EAGLE COUNTY.

The lessees on the Mary Cashen, on Battle mountain, are shipping smelting ore from the 350-foot level, where they made a strike a few months ago. The vein is very irregular. The leasing company has paid to the company in royalties \$1400.

EL PASO COUNTY.

President Fullerton, of the Telluride mill in Colorado City, met a committee from the Mill and Smeltermen's union the 19th inst., at his request, and informed them that he would recognize the union and that he was in no way opposed to organized labor. Men who have been receiving \$1.80 at his mill will be raised to \$2. This will be temporary, until a permanent scale is adopted for all three mills.

FREMONT COUNTY.

The United Oil Co., near Florence, drilled into oil in well No. 307 on the 20th inst., being the third well for the week.

A. N. Moore, manager of the Portland Cement Co., near Florence, has located a deposit of gypsum less than a mile from the plant on the other side of the river. About 2% of gypsum is used in the manufacture of the Portland cement.

The Empire Zinc Co. are putting in four more electrical separators at their Canon City plant, making a total of six, which will give them a capacity of 100 tons per day. In addition to this they have a capacity of 100 tons daily of mechanical table separation. This increased capacity is to handle the increased output in Leadville, all zinc ore handled at this Canon City plant being from Leadville.

The Stadacona Oil Co. reports having struck oil in its well between Florence and Coal creek. Pumps will be put in.

GILPIN COUNTY.

Denver parties will reopen the Star of the West mine, in Lake district, near Central City, under a lease and bond. There is a shaft down 330 feet.

The Cleveland M. Co. is working two shifts at its Spur Daisy shaft, in Eureka district, near Central City. The shaft has been retimbered and sinking resumed from the 300-foot level. When the 600-foot mark is reached the company will install a larger plant of machinery. They are operating the Bon Ton claim in the same group and sinking the shaft to 300 feet. J. Brohl is superintendent.

During the past month the ore shipments from the Quartz hill mines of the Kansas-Burroughs Con. M. Co., near Central City, were 180 cords, of which 165 cars were handled by the Gilpin Tramway Co., the balance being hauled by wagon. The principal part of this production was sent to the stamp mills and concentrator, some ores going to the smelter. They have seventy-five men at work.

The Storm King mine, owned by the Argo G. M. Co., at a depth of 45 feet, is in free milling gold ore that runs \$16 per ton. The vein is 4 feet wide. The company also owns the Denver group of four claims on Independence hill, in Leslie gulch, 2 miles southwest of Rollinsville and 1 mile from the line of the new Moffat road. With the erection of a custom mill at Rollinsville they expect to develop their claims into a paying mine.

The Carcasone M. Co., near Central City, have begun sinking a new shaft on the -traughton lode, one of the cross veins on its property in Illinois Central district, and operations are temporarily suspended on the Detrich claim.

Curnow & Co. have started operations at the Ute mine on Quartz hill, near Central City, and are at work in the 400-foot level, where they have a shoot of smelting and milling ores.

The Aurora mine, near Russell Gulch, has been leased and bonded to Cripple Creek parties who will operate it as the Cripple Creek Gold Temple M. Co. The main shaft is down 400 feet, and will be unwatered, the machinery overhauled, and development work begun.

GUNNISON COUNTY.

A strike is reported made last week on the Gold Hill mine in Taylor Park, near Placer, and northwest of Tincup, showing 2 feet of ore assaying \$300 in silver, gold and copper.

Development work is being done on the Big Medicine and Rough Rider groups. The Big Medicine shows 30 inches of free milling ore, running \$15, and the Rough Rider on Red mountain has a 70-foot tunnel, with 4 feet of free-milling ore, running \$20. A mill will be built this spring. The properties are owned by B. W. Snedeker, A. O. Prose and W. B. Wheeler.

The Tilden Co. has opened a 20-inch shoot of lead carbonates in the incline shaft of the Red Cloud, on Tilden mountain, near Tin Cup.

The Gold Cup mine is being operated from the ninth to the eighth level. In the eighth level a winze is showing a body of ore that carries values in silver.

LAKE COUNTY.

H. C. Burrell, operating the Hopkins property on Mount Sheridan, is taking out considerable lead ore.

The Morocco shaft of the Home Extension M. Co. has found a market for sixty carloads of manganese ore monthly at the Pueblo steel works. The manganese is

worth net \$3 50 a ton. The Morocco shaft is worked under management of A. M. Gaines, receiver.

The new mill of the Resurrection Co., back of Broeze Hill, has a capacity of 150 tons of ore daily.

Mines in the Tin Cup and Taylor Park districts are showing values in lead and zinc, and the prospects for increased output from this section are good.

The Forest Hill Con. M. Co. has a group of thirty patented claims, near Pitkin. They are sinking in a 375-foot shaft, from which levels are run every 75 feet. The vein has been cut by four levels run and the fifth is in 375 feet. The ore is zinc and lead sulphide in walls of granite. The concentrates run \$70 to \$75 per ton, concentrates 10 to 1. The plant has a capacity of fifty tons per day. The mill is to be enlarged.

Manager Evans of the Home M. Co. at Leadville says he will increase the output to 300 tons per day. The grade of the iron being low, the net profit is about 50 cents per ton.

Manager Brenneman of the Rex mine at Leadville, says the Rex shaft has been unwatered. The pumps are throwing about 1000 gallons of water per minute.

Manager T. Owens of the La Belle M. Co. is shipping siliceous ore from the Black Prince shaft, near Leadville.

Manager Dwyer of the Empire Zinc Co. says because of the increased output of their mines at Leadville they are increasing the capacity of their concentrating plant at Canon City.

The Big Evans Gulch M. Co. will put in two large boilers to replace those at shaft No. 2, on account of the increased flow of water met with in sinking the shaft. Manager Collins says he will start the Hoffer shaft on the same property next month.

LAS ANIMAS COUNTY.

Two hundred and fifty feet of the workings of the Engleville coal mine have been cleared and fifty men are at work. The debris which accumulated during the recent fire is being hauled from the mine by hand, the track in the mine having been destroyed by the heat. The fire is still burning in some parts of the mine. There are 1200 feet of workings yet to be cleared and the entire area burned will be retimbered. It is expected the mine will be in full operation by April 1.

LARIMER COUNTY.

A strike of copper ore is reported on the Bonbright mine, in State Line camp, 4 miles north of Pearl. The vein cut in the shaft shows 2 feet of mineral, which assays 20% copper. There is also a body of milling grade. The high grade is being sacked and shipped.

OURAY COUNTY.

The Bachelor mine, near Ouray, is working 100 men on the Khedive tunnel and the mill is treating twenty-five cars monthly.

PARK COUNTY.

In the South London mine, near Alma, a vein of ore 4 feet wide, averaging \$100 in gold is reported, struck in the tunnel, being driven with machine drills. The ore was found 300 feet from the surface. E. W. Logan of Denver is manager.

A vein of ore 4 feet wide and averaging \$100 gold a ton has been struck in the South London mine, near Alma, says J. H. Kuhn, superintendent.

SAGUACHE COUNTY.

A strike of 12 feet of milling ore is reported from Crestone in the lower tunnel of the Cripple Creek-Idaho M. Co. property, on Short creek. The Star Isabel Co., north of Crestone, has men at work overhauling their mill preparatory to starting up next week.

SAN JUAN COUNTY.

The Orado G. M. Co. has been incorporated to operate, near Eureka, the Carle G. and Hydrant groups. The Hydrant millsite is included in their holdings. The main shaft is down 700 feet. The smelting ores average \$40 per ton, and the milling ores \$6 per ton. The plant of machinery will be increased.

Contracts are to be let for a 100-stamp mill for the Gold King Con. M. Co. of Silverton, says Superintendent W. Z. Kinney. The company already has an 80-stamp mill in operation.

SUMMIT COUNTY.

The Iron Mask, near Kokomo, will be reopened by the Arkansas Valley Smelting Co. The Iron Mask is said to show bodies of sulphide iron.

TELLER COUNTY.

The English-American G. M. Co., sub-leased on block 7 of the school section at Cripple Creek, are drifting for the ore shoot that was opened in the 90-foot level.

The estate of the Sacramento G. M. Co. on Bull hill, Cripple Creek, is to be worked again. The west end has been

leased to J. H. Hunt and C. D. Taylor. They will use an incline shaft which was sunk to 200 feet. It is provided in the lease that should they do any sinking it must be started from the surface and be 4 by 8 feet. The east end has also been leased. That part is developed by an incline shaft down 180 feet. The group owned by the company consists of the Sacramento and the Midnight claims, a total of seven and a half acres on Bull hill, near the Last Dollar and the Specimen.

The Amethyst G. M. Co. has given a lease on the Alexander Marsh claim on Raven bill, Cripple Creek, to McMullen & Co. The shaft is down 115 feet, and will be sunk 200 feet deeper. A new plant of machinery will be installed.

The August Flower Leasing Co., operating the Katinka group of claims, on Guyot hill, Cripple Creek, will put in a plant of machinery at their three-compartment shaft, including boilers, a seven-drill compressor, and a hoist with capacity of 1000 feet.

The Vindicator Co. is handling 500,000 gallons of water per twenty-four hours, of which 400,000 gallons are being furnished the city of Victor for domestic purposes. No attempt is being made toward a production from the 1100 and 1200-foot levels. The regular production of 1500 tons of ore a month is being maintained.

Asbestos is reported in the bottom level of the Modoc mine, on Battle mountain, near Cripple Creek.

The three-compartment shaft of the Golden Cycle Co., Cripple Creek, is down 1000 feet, and an additional 200 feet will be sunk before spring. Kenron et al., operating the Ida C., are putting in an air compressor.

Lessee J. K. Lewis, operating on the J. I. C. and Sweepstakes claims of the Republic Co., near Cripple Creek, has opened up a 3 foot vein, which averages \$12 per ton. The Fulton-Marguerite M. Co. has granted a two years' bond and lease on its Marguerite claim on Gold Hill, near Cripple Creek, to L. S. Boswell, for \$15,000.

The total production from the various workings of the Elkton Co., Cripple Creek, averages 900 tons of ore per week, says the Times. Of that amount the company is shipping 400 tons that will average \$20. The best showing in the company's workings is in the seventh level, south. A raise being made from that level shows the ore body 3 feet wide. The main seventh level is being driven north of the shaft and drifting is in progress on the Walter vein. There are ten sets of lessees operating on the group, all shipping. Lessees McFee & Ebe, on the Raven vein, being worked from the Raven tunnel, on the Anaconda side, are taking out ore from a 4-foot body that averages \$20 per ton in gold. They are shipping one car per week.

At the Bolivia mine, near Gillett, the shaft house, which was burned down a short time ago, will be rebuilt and machinery installed. The shaft is 400 feet deep and will be sunk deeper. Manager J. Parfet of the Streeter & C. C. Co., at Gillett, says a plant of machinery will be installed on the Snowshoe claim. At a depth of 100 feet a vein was cut which assays \$15.

Popst, Connor & Williams, leasing on the Acacia, at Cripple Creek, say they have proven up the ore body sufficiently to begin figuring on installing machinery.

Ball & Franklin have a two years' lease on the middle block of the Forepaugh Co. ground, on Squaw mountain, near Cripple Creek, with a 20% flat royalty.

The shaft on the Bolivia mine, near Gillett, will be sunk from the 400-foot level to the 1000-foot. A company has been organized to prospect the group, and the Rustic and Necessity claims have been consolidated with them, making a total of fifty acres. The shafthouse will be rebuilt and machinery capable of sinking 1000 feet will be installed.

Eastman & Co., having a lease in the lower tunnel of the Sunset-Eclipse mine, Cripple Creek, have opened up an ore body that is being broken 4 feet in width and averages \$20 per ton without sorting. They expect to get out a carload per day. The Cripple Creek Good Will Temple M. Co., operating the Gold Sovereign claim, on Bull hill, Cripple Creek, will resume sinking next week and make their shaft 150 feet deeper (700 feet total). Their lease has been renewed.

This week the El Paso Co. started the fifth heading in the drainage tunnel, from the north side of the main shaft at a depth of 600 feet. This lateral will be 1000 feet long before reaching the dyke that carries the main water course of the west side of the camp.

The Gold Coin Co. is employing 130 men, producing eighty tons of ore per day, which averages \$35 per ton.

IDAHO.

BLAINE COUNTY.

On the 18th inst. a fire at the Minnie Moore mine, near Bellevue, destroyed the

pumphouse, carpenter shop, changeroom and storehouse and damaged the mine. Thirty-six men were employed at the mine. The loss is \$6000.

BOISE COUNTY.

At the Overlook group of mines, near Boise, the Chilian mill will be in operation by April 1st, says Superintendent E. Johnson.

The Mineral Hill group of quartz claims, near Placerville, has been bonded for one year to J. O. Barber for \$20,000.

CURRY COUNTY.

The Golden Eagle Dredging Co. of San Francisco are preparing to work a group of 940 acres of placer ground 9 miles from Port Oxford, and extending several miles up Sixes river.

CUSTER COUNTY.

The Lion Creek G. M. Co. has incorporated to operate a group adjoining the Last Packer mine, on Loon creek, with R. McBeth of Custer, C. K. McCornick, D. H. Peery et al. of Butte, Mont.

IDAHO COUNTY.

In the Big creek section, near Tbounder, the Crown and Golden Gate groups of twenty claims are being developed. A crosscut will be driven on the Golden Gate to open up the ledge at a depth of 200 feet. The ore assays \$5. In the spring it is intended to install an electric power plant on Johnson creek, capable of generating 200-horse power, and a cyanide plant on Smith creek, says Manager D. Mackenzie of New York City. On the Crown a contract has been let for 300 feet of tunnel work, to be completed by May 1, which will open the ledge at a depth of 250 feet. Operations are resumed at the Dewey mine and mill, near Thunder.

LANE COUNTY.

The Lucky Boy mine, near Blue Pines, has closed down for the winter on account of snow being too deep in the timber to get out material for the tunnel timbering. About thirty men have been at work.

OWYHEE COUNTY.

Manager McKean, of the Alta-Vista M. Co., near Silver City, reports opening up an ore shoot, near the Black Jack mill, which runs \$400 per ton. Arrangements are being made to operate the drills by electricity.

SHOSHONE COUNTY.

The Basin M. Co., owning a group of claims adjoining the Hercules mine, near Wallace, are driving their crosscut tunnel. The snow is 15 feet deep.

Manager W. L. James of the Alameda silver-lead mine up Nine Mile canyon, near Wallace, says they have their crosscut tunnel in 400 feet and last week a vein 2½ feet wide containing galena was found.

The New Jersey G. M. Co., which has bought the group of claims 3 miles east of Wardner, on Gold Run creek, will put up a 10-stamp mill.

There is a local report at Wallace that there is an effort being made to consolidate all the silver-lead mines of the Coeur d'Alenes under one company. It is said the American S. & R. Co. has agreed to take sufficient stock to have the controlling interest. The only properties not in the deal are the Hercules and the Empire State-Idaho Co.

O. P. Lee, a miner, was crushed to death at the Bunker Hill & Sullivan mine last week by a cave in the roof of the drift. He was engaged with another man timbering the drift at the time.

Because the mine was not being worked at a sufficient profit sixty-seven men were laid off permanently at the Frisco mine this week. The day shift of the mill has been closed and from now on will run only during nights. A force of 175 men is retained, but previous to this lay-off another force had been released. The cause for the reduction reported by the management is that the ore in the upper workings is too low grade to be mined at a profit. The men who have been retained will work on the 2000 level. About the last of March the shaft will be sunk to the 2100-foot level.

A shoot of galena was struck last week in the Constitution mine, owned by F. Gilbert & Co., on Pine creek, near Wardner, on the foot wall at 190 feet from the mouth of the tunnel. There is zinc ore on the hanging wall.

MICHIGAN.

HOUGHTON COUNTY.

The management of the Allouez mine, near Calumet, has decided to sink a vertical shaft to strike the Kearsarge lode, which is thought to underlie the property at a depth of 1000 feet.

At the Quincy mine, near Hancock, thirty jigs will be put in, completing the equipment of the new mill, making ninety-two in all. The company finds with the new mill and mill equipment a saving of 6 cents per ton in the cost of handling rock,

being reduced to 20 cents per ton. The Quincy is handling coal from the dock to the mine for 10 cents per ton, as compared with an average cost of 50 cents at the other mines.

The Champion M. Co., near Houghton, is clearing land for the erection of twenty-five additional houses near the thirty just completed. The Trilmountain will build fifty houses in the spring.

From all the openings on the branch vein at the Michigan, near Houghton, last year an average of 480 pounds of mass and barrel copper were sent to the smelter for every cubic fathom of ground broken. The crosscut to the branch vein from the 12th level of B shaft is in 150 feet. B shaft is sinking to the 13th level. Fourteen drills are working in the mine. The branch is said to be making towards the Minnesota conglomerate.

The Copper Range Railroad is hauling five carloads of refined copper from the smelters daily, this representing the output of the South Range mines. The new machine and blacksmith shop of the Champion is now ready for equipment. No. 4 shaft of the Trilmountain will be producing by July.

ONTONAGON COUNTY.

The result of last year's operations at the Mass mine, near Ontonagon, shows an output of 2,700,000 pounds of refined copper, which was marketed at an average of 12½ cents per pound.

G. L. Walker of Boston says negotiations are on for the consolidation of the Adventure, Mass, Michigan and Victoria mines, near Ontonagon, and to also purchase several inactive properties in the same district and operate them together, the Victoria water power to generate electric power for the development, mining, milling and local transportation purposes.

ST. CLAIR COUNTY.

At the Capac marsh, 3 miles from Capac, the American Peat Fuel Co. of Calumet are taking out peat, and they have installed briquetting machinery. By spring they expect to be producing 200 tons a day, for which they are getting \$4 per ton. The peat covers an area of 2200 acres and lies to an average depth of 16 feet. Six hundred tons of raw peat are required to produce 200 tons of briquettes.

MONTANA.

BEAVERHEAD COUNTY.

P. M. Sweeney has located a graphite claim in the Sheep creek basin, near Dillon. The vein is 30 feet wide. Samples sent to the Dixon Graphite Co., Jersey City, N. J., are reported to be of good quality.

Copper glance assaying 25% has been found in the Monument mine, Bloody Dick district. The ore will be shipped. Hundreds of tons of copper ore are reported exposed on the surface. The ore also carries gold values.

DEER LODGE COUNTY.

The Homestake M. Co. has bought the Sailors Dream mine for \$25,000. It is a gold proposition and contains some rich ore.

FERGUS COUNTY.

Manager W. M. McLean of Lewistown says a mill will be erected in the Little Rockie by the Alder Gulch M. Co., of which E. W. King is president. The company's group includes nine patented claims, and it is a cyanide proposition. The mill will be of 100 tons capacity. Ad Mont.

LEWIS AND CLARKE COUNTY.

C. Hartman and T. Cooney of Helena have a bond on all of the Opbir placer claims below Helena, comprising a strip of 2 miles long and ½ a mile wide.

MADISON COUNTY.

Two new 100 H. P. boilers are being put in at the Galena mine, near Sterling.

MISSOULA COUNTY.

G. H. Loehr and P. M. Mahler of Chicago have control of the Amador copper mine, near Iron Mountain. All details have been completed and operations will be resumed.

VALLEY COUNTY.

Oil seepages have been found south of Malta. A company will make a test of the field by drilling.

NEVADA.

ELKO COUNTY.

At the Wakefield mine, near Tuscarora, operations have been suspended, owing to failure of pump to handle the water.

EUREKA COUNTY.

W. H. Tibbals of Salt Lake City, Utah, has bonded a group of fourteen claims in the Diamond district for \$60,000; time, eighteen months.

ESMERALDA COUNTY.

The Southern Nevada G. M. Co. has bought a group of mines near Red Mountain and Silver Peak. Development work will be continued and a reduction plant built at Silver Peak.

LINCOLN COUNTY.

The Cyrus Noble M. Co. has incorporated to operate the Otis mine near Searchlight; G. E. and K. M. C. Otis, H. Surr, A. S. Auchinloss and S. A. Marsh. The principal place of business is Redlands, Cal.

The shaft at the Techaticup, at El Dorado canyon, will be sunk to an additional depth of 420 feet.

Smith & Bowman have temporarily suspended operations on their Summit Springs group, near Searchlight.

The new mill of the Quartette Co., at Searchlight, will have cement mortar blocks and other modern equipment. The water supply is obtained from the Colorado river.

NYE COUNTY.

In the Montana-Tonopah shaft at the 600-foot level, ore stringers and decomposed quartz extend nearly across the bottom of the shaft. This is 50 feet below the drifts on the ledge from which the ore is being mined.

T. Colehan, vice-president of the Coleman M. Co., near Butler, says the shaft on the Eliza Jane claim is being sunk to 200 feet, and another shaft will be sunk on the Polo claim.

The Florence Extension M. Co. has incorporated to work a group of seven claims in Liberty district, 25 miles north of Butler; T. Fleming, W. Tamblin, R. Dougherty and F. H. Maxwell.

A new mining district is reported by the Tonopah Bonanza, 25 miles southwest of Butler. There are seven ledges in granite, slate and limestone. The veins are described as large and containing \$5 and over per ton gold. Thirty claims have been recorded in the new field, which is known as the Grandpa district. There is a spring flowing 3 inches of water within 1/2 mile of the first locations made.

STOREY COUNTY.

Operations at the Con. Virginia are continued with no important change. The water at the Combination shaft stands at 200 feet below the floor of the 1950 station, or about 400 feet below the Sutro tunnel level.

There is a strike at the Butters cyanide plant in Six-mile canyon, near Virginia City, owing to the men being paid at the rate of 30 cents per hour instead of \$3 per eight-hour shift.

Superintendent E. M. Gorbam has resumed work on the Brunswick lode, near Virginia City. The steam hoist will be used until electric motors and machinery are installed.

WHITE PINE COUNTY.

A strike is reported on the 300-foot level of the Saxton mine at Ely of black copper sulphide ore which assays 4 1/2% copper and \$5 in gold.

NEW MEXICO.

GRANT COUNTY.

The Comanche M. & M. Co. has bought the Silver City smelter. The plant has a capacity for treating 250 tons per month. The Silver Cell silver mine at Pinos Altos has been reopened by Dimmick Bros.

F. Deming says a flow of water has been struck in the Neosho shaft, owned by the Alessandro M. Co., near Silver City. The flow averages 10,000 gallons a day and the shaft will be sunk deeper. A 50-ton leacher will be installed.

The Lena concentrator at Lordsburg has been sold to the American Con. Copper Co. Machinery will be added.

The present production from the iron mines of Fierro and Hanover is 1000 tons daily, averaging 56%. Part is shipped to Pueblo by the Colorado F. & I. Co., and the rest to El Paso for smelter flux.

OREGON.

BAKER COUNTY.

Superintendent H. D. Spaulding of the Del Monte mine at Sparta says that on the 180-foot level they have crosscut a 14-foot ledge of sulphide ore.

The Gem mine, near Sparta, owned by A. Geiser of Baker City, is sinking to the 600-foot level, opening up ore.

It is reported that at the I. X. L. mine, near Baker City, last week while driving a crosscut in the lower workings in opening a vein of ore they tapped a stream of water which forced the men out of the mine. The machinery was inadequate to handle the flow. The mine was closed down temporarily, as the snow is too deep to bring in additional machinery. F. Kelly is manager.

Miners at work in the White Swan

mine, in the Virtue district near Baker City, struck the "red" ledge last week in a crosscut from the third level.

The Badger Co. is sinking on the Bull of the Woods claim of the Homestake group, near Sumpter. At present the concentrating plant is not operating, freezing having injured some of the water pipes. Driving the adit tunnel to connect the shaft with the mill continues from both directions.

Manager C. R. Aldrin, of the Tempest mine in Greenhorn district, near Sumpter, says a matte smelter will be installed this spring.

Another strike has been made in the Old Virtue mine, 6 miles east of Baker City, says Manager Buckbee. The ore was found in a pocket. One piece weighing ninety-two pounds yielded \$10,000.

JACKSON COUNTY.

The Opp quartz mine (the Beckman & Huffer mine), near Jacksonville, has been sold for \$150,000 to a Boston company. A. U. Mills of Tacoma, Wash., is president. A 20-stamp mill will be built. There are 2000 feet of tunnel and shaft work done.

D. S. Sanford of the Shorty Hope M. & M. Co. says work will be resumed on the Shorty Hope quartz mine, near Ashland.

JOSEPHINE COUNTY.

The Scribner-Henderson mine, near Wolf creek, has been sold to the Mountainview Copper Co., of which W. E. Olmstead is manager, and which owns copper interests in the Waldo district. The Scribner-Henderson ores are free milling and development will begin next week and a complete plant and mill will be installed.

SOUTH DAKOTA.

CUSTER COUNTY.

Manager D. Henault of the Crown mica mine, near Custer, has resumed work on that property.

The Extreme M. & M. Co. of Custer owns three groups of mines near Custer. On the London group, one of these, a plant of machinery is to be built. The ore will be treated by cyanide or by the chlorination process. I. Downing of Custer is superintendent.

The shaft of the Gertie Co., near Hill City, is down 500 feet. The vein contains both gold and cassiterite; E. C. Johnson, superintendent. A crosscut is being run to reach the vein, which in sinking dipped out of the shaft.

LAWRENCE COUNTY.

The Golden Reward Co., at Deadwood, have their large cyanide plant in operation, although the smelter is shut down by reason of the strike. It is reported the management is considering the advisability of shipping the high-grade ore to Omaha for treatment.

J. R. Pbelan is preparing to ship ore from the Blon mine, near Galena, to the Rapid City reduction works.

A mill test has been made on ore from the claims of the Ak-Sar-Ben G. M. Co., on Annie creek, near Terry, and gave returns of \$10.40 a ton, the extraction being 71% by crushing to 30-mesh. The ore had been taken from three openings on the company's property and was a general sample of the ore exposed. A similar test was made on ore from the main shoot of the University Co., adjoining the Ak-Sar-Ben group. The mill extraction was 73% at 30-mesh. It is a shale ore, similar to that found in the Dakota in the vicinity. The Dakota Co. is making a profit of \$1.18 a ton on \$4.11 ore. The ore is hauled 8 miles by railroad to the Deadwood mill of the company. The Ak-Sar-Ben and University companies have had a millwright and engineer on the ground and a preliminary survey has been made for a mill to be built jointly.

The University G. M. Co., on Annie Creek, near Terry, has developed an ore body reported 50 feet wide, 18 feet thick at the center and of unknown length. The ore averages \$6 per ton. This is one of the flat sheets occurring in the Cambrian. A mill will be built in the spring. R. Fitzgerald of Deadwood, superintendent.

The Gladiator M. Co., of Deadwood, will build a 100-ton cyanide mill in Deadwood gulch, a mile above Central City. C. H. Crabtree, of Des Moines, Iowa, general manager, is in charge.

UTAH.

BEAVER COUNTY.

H. M. Crowther, managing director of the Blue Acre Copper Co. at Blue Acre, says shaft No. 1, down 100 feet, has struck an ore shoot along the foot wall of the vein which assays 11.6% copper, 7.2 ounces silver and \$6 gold. The shaft will be continued to the 200-foot level, from which point drifting and crosscutting will begin. L. E. Kiser is superintendent.

Superintendent G. Morehouse of the Erie M. Co. mines adjoining the Majestic,

near Milford, says at a depth of 175 feet the shaft has cut 8 feet of copper-bearing quartz.

At the Beacon mine, near Shauntie, out from Milford, last week, the tunnel being driven for the old workings cut the vein, opening up a body of carbonate ore, carrying 45% iron, with values in gold and silver, a flux sought by the smelters. The tunnel will be pushed ahead to the incline 20 feet farther, giving it a depth of 80 feet. The Beacon is owned by A. Potberingham, J. Forgie, J. Leysbon, G. Reynolds and C. Smith.

G. Moore, manager of the Atlas mine, near Milford, says he has men at work developing a body of milling ore that will justify installing a concentrator. The ore body is 20 feet wide and carries 12% lead.

The shaft at the Beaver Con., near Milford, is 160 feet and will be sunk to 500 feet before crosscutting for the vein is begun. Twenty-seven men are employed at the Beaver Con. and Ben Harrison.

At the Old Hickory mine, of the Majestic Co., near Milford, a strike was made this week in the main tunnel, opening up a body of bornite and black sulphides 4 feet wide. The main tunnel is in 230 feet, reports Foreman Price, and 162 feet more will bring it to the shaft. The winze from the tunnel level is down 18 feet. Crosscut No. 1 is in second-class ore 30 feet wide. The shaft is down 150 feet and showing black sulphide. A 34 H. P. hoist and galloos frame are being set up. A self-dumping skip will be used and an ore bin of 300 tons capacity built. At the smelter the structural work is about completed, says Manager Farish.

GRAND COUNTY.

Work was started last week on the Mineral Mountain tunnel, near Basin, in charge of J. McMahan, one of the owners. It is the intention to drive ahead until they cut the Sky Lark vein, which will be 50 feet from the breast, now in 300 feet. The Sky Lark shows gold and copper ore on the surface.

The Grand View M. Co. will resume by April 1st with tunnel work on its group on Horse mountain, near Basin, and continue the same until it reaches the Lincoln vein at a depth of 500 feet.

The mines and the smelter of the Paradox-La Sal Co. at Basin La Sal are in operation. Their ores carry silver and copper.

The Tornado-Indiana Co. at Basin will be ready for operations on April 1.

W. J. Gardner & Co. of Cripple Creek, Colo., are driving a tunnel on the Gold bill group, adjoining the Iowa on the west, near Basin. They are drifting in on the Iowa vein 1200 feet west of the Iowa tunnel.

A new company has been formed to work on Grouse mountain, near Basin, on property forfeited last year by the Josephine Copper Co. of Denver, Colo. The company is the Grouse Mountain M. & S. Co. of Huntington, W. Va., with W. R. Wheat as resident manager.

IRON COUNTY.

Manager Parker of the Ophir M. Co. mines and mill at Stateline says the mill will be remodeled and a cyanide plant installed.

JUAB COUNTY.

The Centennial Eureka of Tintic district, near Eureka, is to be equipped with an independent electric lighting plant capable of supplying 400 lights. Underground as well as the surface will be provided with electric light. Preparations are being made to resume sinking the shaft below the 1400-foot level, 500 feet, and a station is being cut.

The shipments from Tintic district, around Eureka, last week amounted to 126 cars of ore, as follows:

	Cars.
Centennial-Eureka	45
Carisa	2
Dragon Iron Mine	23
Eagle and Blue Bell	2
Gemini	6
Grand Central	24
La Clede	1
Lower Mammoth	4
Martha Washington	2
Mammoth	9
Noon Iron Mine	2
Uncle Sam	1
Yankee Cons.	5

Superintendent T. Weir is taking out copper-silver-gold ore in driving a 200-foot upraise from the 500-foot level in the Morning Glory of the La Clede M. Co., near Eureka.

The Lower Mammoth has made a contract with the smelters for a large tonnage of ore that carries 50% iron, ten ounces silver and 80 cents gold, of which the initial shipment of three cars was sent out last week. Superintendent Ball also shipped a 30-ton lot of 50-ounce silver ore from the 1050-foot level of the east fissure.

Manager L. E. Riter of the Dragon iron mine, near Eureka, says the quarry

has been worked as deep as it is practicable, and the iron ore will be hoisted through the 600-foot shaft sunk two years ago.

SALT LAKE COUNTY.

At the United States smelter at Bingham the management has given orders to double the capacity of the ore bins, which are at present 780 feet long and 25 feet high. The receipts of ore from the Centennial Eureka and from their Bingham group are increasing.

The "independent" smelters of the Salt Lake valley forwarded to the Eastern refineries this week approximately 700,000 pounds of copper bullion. The United States shipped three carloads (185,261 pounds), the Highland Boy five cars (300,000 pounds), and the balance by the Bingham Con.

SUMMIT COUNTY.

Superintendent Turner of the J. I. C. mine at Park City says the shaft is down 420 feet and being sunk at the rate of 5 feet a day.

Ad Utah

TOOELE COUNTY.

The Lucy L. M. & M. Co. has incorporated to operate the Lucy L. group of four claims in the Clifton district, near Ibapah. C. H. Wilson is president and F. L. Wilson secretary and treasurer.

A body of copper ore has been struck at 250 feet in the shaft of the Climax mine, owned by J. P. Gardner et al., in Deep creek, near Ibapah, in Clifton district.

WASHINGTON.

FERRY COUNTY.

The Gold King mine, on Upper Lambert creek, near Republic, has been bonded to J. D. Harper for \$10,000 by the Gold King M. Co., for six months. T. M. Hammond, Jr., is president of the company. The Gold King adjoins the Belcher.

C. T. Bliss of Spokane has an option on the Lone Pine-Surprise mine in San Poil gulch, north of Republic, for \$150,000. Machinery will be installed and development work increased.

STEVENS COUNTY.

The Gold Bug M. Co. of Tacoma has resumed work on the Gold Bug at the head of Pierre lake, near Bossburg. The shaft down 175 feet will be sunk to 300 feet. G. Bishop is superintendent.

J. W. Macdonald is developing the Macdonald group, 1 mile west of Bossburg. He is driving a tunnel in which he has cut two veins, both carrying values in gold and nickel.

The Minorca mine, in Flat Creek camp, near Ryan, has begun ore shipments.

FOREIGN.

AFRICA.

GOLD COAST.

The Asbanti Gold Fields Corporation reports that during January 2600 tons from the Obuassi mine and outside development were crushed, producing 2810 ounces.

The Asbanti Sansu crushings for January were 1210 tons, which produced 1260 ounces. The tallings have increased in value from 3 dwt. to 5 dwt.

RHODESIA.

The Eagle Vulture in January produced 975 ounces from 1392 tons.

At the Red and White Rose the January report was: Mill ran thirty days, producing 2179 ounces from 3619 tons crushed; recovered by cyanide, 431 ounces from 3257 tons treated; total yield, 2610 ounces.

At the Rezena the January result was: Crushed, 2425 tons, recovering from mill 837 ounces fine gold; from tallings by cyanide, 84 ounces fine gold; total, 921 ounces fine gold.

TRANSVAAL.

A late report on the labor question on the Rand is as follows. The native labor statistics for January show lower figures than those of any month of 1902 except February, when the Native Labor Association was formed. The total number of natives brought in was 3875, the greatest decrease being in the supply from the east coast, which was less by 914 than that of December. There were increases in the supplies from Zoutpansberg, the Low Country and Mozambique; 45,068 natives are now working in the gold mines and 7395 in the coal mines.

A commissioner has been appointed to investigate Chinese labor in China, with a view to its employment in the mines of the Rand. He will visit California to inquire into the methods of working the Chinese in that State.

AUSTRALIA.

The gold output for Australia in 1902 shows a marked increase over that of 1901.

The production of the several States and colonies was as follows:

COMPARATIVE STATEMENT IN FINE OUNCES.

State and Colony.	1901. Fine Ounce.	1902. Fine Ounce.	Inc. Fine Ounce.	Dec. Fine Ounce.
West. Australia.....	1,708,417	1,867,099	168,682	.....
* Victoria.....	730,453	729,299	.....	1,154
Queensland.....	598,362	623,331	24,969	.....
New Zealand.....	412,877	458,933	46,056	.....
New South Wales.....	216,888	254,435	37,547	.....
	3,662,017	3,893,027	231,010	1,154

Net increase in fine ounces for 1902, 271,010
* Valued at \$1 per ounce.

BRITISH COLUMBIA.

(Special Correspondence.)—Since the beginning of the year five carloads of ore have been sent to the Nelson smelter from the Hunter V. mine, near Nelson—a total of 100 tons. This ore is being raw-holed at the rate of six tons a day. C. Wolfe, manager of the Foghorn mine, on Wild Horse creek, near Nelson, reports a strike of 18 inches of sulphide ore in the crosscut tunnel, in 25 feet. Drilling will continue until the main vein is struck. The heavy fall of snow this year is hampering the Golden Monarch M. Co. in its working on the Foghorn, and has obliged them to reduce their working force, due to the difficulty of getting in supplies.

Roseland, Feb. 21.

The Bureau of Provincial Information has issued the following figures of ore tonnage for 1902:

	Tons.
Grand Forks, Kettle River and Osoyoos divisions.....	525,000
Trall creek.....	340,000
Slocan and Ainsworth.....	30,000
Nelson.....	80,000
Coast district.....	25,000
East Kootenay.....	20,000
Other districts.....	25,000

Total.....1,045,000

The Mother Lode smelter of the British Columbia M. Co., at Greenwood, will double its capacity during the coming year.—The Standard Oil Co. are reported to be buying coal and iron in Nicola valley.—Free gold quartz has been opened at the Coronation mine, eight miles south of Gerrard, says the Prospector.

F. C. Green is at Camhorne surveying for the site of the Eva stamp mill and laying out the tramway line. The Calumet & B. C. Gold Mines, Ltd., at Camhorne, will haul their stamp mill in over the snow this winter, and the management state that as soon as the necessary data for the contract is secured the contract for the tramway will be let.

The Silver Gleaner, on Bear creek, in the Slocan division, is shipping weekly. The American Boy has contracted to ship a portion of their ores to smelters of the American S. & R. Co., the first contract made in the Slocan with this smelter.

The Flesher Malden has contracted with the Trall smelter for treating 1000 tons of high-grade ore. The ore averages 150 ounces silver, 6% lead and 12% zinc. The main vein and a large body of ore have been struck in tunnel No. 8, of the Payne mine. This adds 400 feet of stoping ground to this property.

Managing Director G. B. McAulay, of the Cariboo M. & M. Co., Ltd., mines at McKinney, in his annual report says there was mined and milled during the year 11,414 tons of ore from the Cariboo claim, 4100 tons from the Okanogan, 100 tons from the Saw Tooth, a total of 15,614 tons. The average value of the ore was \$9.65 per ton, 69.8% of which was extracted as free gold by amalgamation, 17.4% obtained in the concentrates, and \$1.27 per ton was lost in the tailings. During the year 1040 feet of drifts were run and 190 feet of upraises made.

The Velvet mine, near Roseland, is shipping forty tons per day and has started to stope level No. 5.

Shipments of ore from the Roseland camp for the week ending Feb. 21st were: Le Roi, 3730; Centre Star, 1310; War Eagle, 1110; Glant, 40; Velvet, 150; Le Roi No. 2, 385; total for week, 6725; year to date, 51,916 tons.

Returns from the Ymir mines show a net profit for the month of \$10,000, the highest since May last.

The Spyglass mine on Popular creek, near Lardeau, is producing silver-gold ores. It is owned by J. Winquist & Co. and is 11 miles from the line of the Lardeau railway. Assays show 1500 ounces silver and \$80 gold.

D. Cameron of Ymir, superintendent of the Union Jack mine of the Active G. M. Co., says at 165 feet in, on the lower tunnel on the Queen vein, a shoot of galena 4 feet wide has been struck, which averages \$25 per ton. Operations on the Union Jack vein are stopped pending the completion of the electric plant, which will be ready next week.

The Granby Co. has bought the Iron-

sides fraction claim, adjoining the Banner of the Granby group, and was secured largely for its timber. The tilting reverberatory furnace at the Granby smelter is in operation, being used as storage for molten matte, which is drawn off and used in the converters as occasion may require.

The Cariboo mine, Camp McKinney, earned \$136,000 last year from the proceeds of ore treated. Of this sum \$60,000 was spent on development work, \$50,000 applied to payment of dividends, and the balance placed in the reserve fund.

The Giant mine has been compelled to close down. The Trall smelter declined to accept its ore until the coke famine is relieved. Otherwise the local mines are not affected, as yet, by the fuel situation.

Up to the 21st inst. 550 members have enrolled in the Provincial Mining Association, of whom more than half are working miners.

CANADA.

ALBERTA.

J. J. Fleutot, superintendent Frank coal mines, on the Alberta side of the Crow's Nest, says they will install fifty coke ovens at Frank this spring. These ovens will not be of the beehive pattern, but built on a plan by which the coal in the course of the process is carried through a number of chambers. By this method, says Fleutot, the process only takes twenty-four hours, instead of seventy-two, as with the beehive oven. These ovens will each produce three tons of coke per day.

MEXICO.

CHIHUAHUA.

The second payment of \$350,000 gold is to be made on the San Francisco del Oro mine, near Parral, on March 1. This company also owns the La Union mine near Parral. G. Parral, of Parral, is manager.

D. H. Moffatt of Denver Colo., is reported to have bought the mines of the Batopilas M. Co., at Batopilas.

GUANAJUATO.

Manager Bryant of the La Luz Mines Co. of Denver, Colo., operating near Guanajuato, reports ore showing in fifteen different places in the three mines of their group. One of the veins runs 8 feet in width. The company is at present doing development work only and has 300 men at work. The ore being taken out in the course of development runs \$20 per ton in gold. The company plans to erect a 100-ton cyanide mill this spring. A profit of \$10 per ton is being made on the ore removed, but with the ore treated on the ground this profit can be increased to \$15 per ton, says Bryant. The power plant that is to supply the district with electric power will be ready to start up by August and the La Luz Co. will then equip its properties with electric hoists, pumps, etc. It will use at the mine and at the mill 600 H. P. One year ago the Sirena mine, owned by the Guanajuato Con. M. Co. of New York, was the only property being operated in this district. Boston parties have bought the Bolanitis mine. A company has been formed in New York to operate the Carmind, a former producer. Chicago men have bought the Cubo. D. G. C. MacNeill owns, and operates the Santa Anita. The Cedro mine is being operated by native Mexicans.

JALISCO.

The lixiviation plant of the San Vicente M. Co. at Ameca is in operation.

LOWER CALIFORNIA.

The Peninsula C. & S. Co. has bought the Santa Maria group of claims, near San Quintin, 15 miles south of San Julio canyon, and has sixteen men developing by shaft and crosscutting. A crosscut at one point opened 20 feet of copper ore, some of it carrying gold. Dikes cut the country in a northeast by southwest direction, and the ore is found near these. The mines are 18 miles from the Pacific ocean. The same company is working on the Julius lease, where 3000 feet of development has been done and ore of medium grade blocked out. The Canary Bird, 2 miles from the Julius Caesar, being developed at the 200-foot level, carries glance ore, but, unlike the Santa Maria group, neither the Julius Caesar nor Canary Bird carry gold or silver. The same company is developing the Columbia, a gold property near San Andreas. The McAnaney mill, near Jacalitas, back of Ensenada, has been bought by the Peninsula Co. and a site for a copper smelter has been secured at San Quintin. G. P. Brown of Los Angeles, Cal., is general superintendent.

The Paderra Onyx Co. has six teams hauling onyx to the beach at Point Santa Catarina, and from there it is shipped to San Diego, Cal. One piece weighing six and one-half tons was recently shipped.

J. W. Dawson of Los Angeles, Cal., representing Eastern men, has bought a

group of five claims in a new section of the peninsula known as Chapalo.

SONORA.

The Lloyd Bros. & Co. are developing the Plomosa de Santa Ana mine, 12 miles south of Trinidad. They have a silver-lead ore with values in gold and copper. Shipments will begin next week.

The Anglo-American Copper Co. have men at work on their gold and copper properties in the Santo Domingo mountains, south of Cananea, near Bacoachi. The company has 200 pertenencias, four tunnels have been driven, and the ores show iron, copper, gold, carbonate of lead and zinc.

Near Hermosillo the El Majin C. Co. is preparing to begin operations on a large scale.

NICARAGUA.

There are in the republic of Nicaragua forty-one mines of which official record is kept. During 1902 these produced a total of 78,000 ounces, valued at \$1,326,000. The ore is sulphide. The country rock is sandstone, volcanic rock and granite. In the Department of Leon and also in Matagalpa, the gold is very fine, occurring in white, chalky soft rock, and is extracted by the cyanide process. In New Segovia and Prinzapula, on the branches of the Rio Coco and Prinzapula rivers, some placer mining is done on a small scale, and some nuggets of five ounces have been found.

SALVADOR.

In the department of Morazan the Loma Larga, owned by the sons of ex-President Mariscal Santiago Gonzalez, consists of 10,000 acres of land, divided into four mineral zones. The principal vein is Loma Larga, silver and gold, averaging \$20 gold. This vein is 3 feet wide. The principal shaft is 393.6 feet deep and the main level 1640 feet long. About 30,000 tons of ore have been taken out of this vein. Water has now prevented further working. The San Francisco vein is 6.5 feet wide and runs \$10 per ton, silver and gold. The gold is free. The quartz is soft, a man extracting with a bar from six to eight tons per day. The main shaft is 229.6 feet deep, with 1640 feet of drifts. The Mantos del Socorro and De la Senora are most worked at present and run \$12 gold per ton. At the present time 600 tons of ore is treated monthly by the cyanide process. One hundred and fifty men are employed, all natives. The capacity of the plant is forty tons per day.

SIBERIA.

Gold mining in the Primorski region is divided into two parts—the northern, on the Amur river and the Okhotsk sea, and the southern, on several little rivers along the South Ussuri district and the island of Askold. Mining has increased in the former since the construction of the Ussuri & Transbaikalian Railroad. Trial excavations are made at a distance of 1 verst (0.663 mile) apart. The whole area is divided into triangular lots, formed by the lines of pits, and draining canals are dug and the necessary buildings are constructed. The work begins with stripping, by hand digging, horse cars carrying the turf away; but recently they have begun to wash the turf away by ground sluicing. A workman is paid from 61.2 to 92.7 cents a day. The washing is effected by barrel engines moved by locomotives. The richest gold layers in the South Ussuri region have been worked by the ancient Chinese processes. The lack of technical knowledge in gold mining is the principal reason why its development is so slow. The chief gold mining works in the province of Primorski were established during the last ten years, and a great number of gold veins of this region are not yet worked.

PERSONAL.

J. M. FORD of Phoenix, Ariz., is in New York.

A. J. OREM of Salt Lake has gone East on mining business.

P. A. H. FRANKLIN of Salt Lake City, Utah, is in Boston, Mass.

R. G. WILSON has returned to Salt Lake City, Utah, from California.

E. F. ADAMS, a mining man of St. Louis, Mo., is in San Francisco, Cal.

E. H. RANDELL of the Denver, Colo., Mining Reporter, is in San Francisco, Cal.

J. A. EDMAN, a pioneer California miner, is in San Francisco from Plumas county, Cal.

MANAGER PARKER of the Ophir M. Co. at Stateline, Utah, has returned from the East.

J. R. LEONARD of Pittsburg, Pa., has recently been at Octave, Ariz., and is now in California.

F. F. THOMAS, general manager of the Gwin mine, Calaveras Co., Cal., is in San Francisco, Cal.

R. HECKSHER, of London, England, interested in the Clifton Con. M. Co., is in Clifton, Ariz.

H. M. GORHAM is superintending operations on the Brunswick lode, near Virginia City, Nev.

MR. MCCLINTOCK of F. W. Braun & Co. has returned from San Francisco to Los Angeles, Cal.

C. A. ROSS, president of the Standard copper mines, is in Clifton, Ariz., from London, England.

W. E. BURK of Louisville, Ky., has been making mine examinations in Graham county, Arizona.

H. T. POWER, manager of the Hidden Treasure mine, in Placer county, Cal., is in San Francisco, Cal.

A. J. ANDREWS of Montreal, Canada, part owner of the Dollie B mine, at Leadville, Colo., is at the mine.

J. B. HUBINGER and J. W. WHITMORE have returned to New Haven, Conn., from Phoenix, Ariz.

MANAGER R. G. WILSON of the New York Bonanza has returned to Salt Lake City, Utah, from California.

C. A. ROSS, president of the Standard Copper Co., near Clifton, Ariz., has arrived from London, England.

A. M. RUCKER is superintendent of the Nevada Con. G. M. & M. Co. at King Flats, near Central City, Colo.

PRESIDENT SOPERS, of the Bayard M. Co. at Golden, N. M., has been visiting the mines from Toronto, Canada.

F. B. COOK has returned to Salt Lake City, Utah, from Montana, where he has been examining mining properties.

S. A. PARNALL, general manager of the Burrage mining interests at Terrazas, Chihuahua, Mexico, is in Michlgan.

P. W. FLEMING and J. B. COPLIN of Tucson, Ariz., have been examining the Golden Wonder mine in Gila Co., Ariz.

A. F. HOLDEN of Salt Lake City, Utah, managing director of the United States M. Co., is visiting at Santa Barbara, Cal.

H. H. HARVEY, mining engineer, has returned to Oakland, Cal., from making mine examinations near Jamestown, Cal.

H. A. SMITH has returned to Salt Lake City, Utah, from Elmore county, Idaho, where he is interested in the Ella Hill group.

D. S. SANFORD of the Shorty Hope M. & M. Co. and M. J. Goldner, treasurer of the company, are in Ashland, Or., from New York.

ASSISTANT SUPERINTENDENT DUNYAN, of the Daly-West, has resigned that position to take charge of another Park City property.

MANAGER W. A. FARISH of the Majestic Co., near Milford, Utah, is examining mines in Arizona, of which he is consulting engineer.

G. E. VOORHEES, JR., of Santa Barbara, Cal., principal owner of the Las Vigas mine at Coyame, Chihuahua, Mexico, is visiting the mine.

A. C. ELLIS of the Salt Lake-Tonopah M. Co. returned to Salt Lake City, Utah, last week after an absence of several weeks in Nevada and California.

W. F. SNYDER of the Western Exploration Co. has returned to Salt Lake City, Utah, from an inspection of the company's California properties.

R. HANLEY, formerly superintendent of the Niagara mine at French Gulch, Cal., is superintendent of the Horseshoe M. Co., near Deadwood, S. D.

R. WILLIS, manager of the Coronation M. & M. Co., near Idaho Springs, Colo., has gone East to attend a meeting of the stockholders of the company.

P. L. BANNAN is president and manager of the Pacific Gear & Tool Works of San Francisco, Cal., and P. Lawlor is secretary of the same company.

H. BROWNLEE of New York, of the Bingham & New Haven Co., accompanied by Manager F. Benedict is inspecting the Frisco-Zelnora mines near Frisco, Utah.

C. O'KEEFE, president and manager of the Sonora M. & M. Co., returned this week to the mine, 60 miles northwest of Magdalena, Sonora, Mex., from Phoenix, Ariz.

C. R. DOWNS, superintendent of the Bunker Hill mine near Amador City, Cal.,

has returned from San Francisco, Cal., to his home at Sutter Creek, Cal.

F. L. SLOCUM, vice-president of the Miami M. Co. of North Carolina, is in San Francisco, Cal., and will examine some of the mines of Amador county, Cal.

S. L. PEREMAN of St Petersburg, Russia, a large iron founder, and D. Grassmoff, consulting engineer, are in northern California inspecting mines and mining methods.

MANAGER H. LA MONTAGUE of the Sultana mine, near Hillside, Ariz., is at the mine overseeing the erection of a stamp mill and cyanide plant for that property.

BURDETTE MOODY, chief engineer of the Homestake Co. at Lead, S. D., has resigned to associate himself with Henry Schmitzel, E. M., to give attention to private interests.

W. H. MCCLINTOCK, president and manager of the Don Pedro M. Co., operating near Don Pedro, Tuolumne county, Cal., has established his headquarters in San Francisco, Cal.

J. C. KORTZ of Cleveland, Ohio, president of the Ohio & Colorado Smelting Co.; J. M. Thomas, treasurer, and T. Goodwin, general manager, were visiting the mines of Leadville, Colo., this week.

G. J. JOHNSON, superintendent of the Colorado Fuel & Iron Co. mines at Madrid, N. M., has been transferred to Starkville, Colo., and Superintendent Lamh, formerly of Starkville, takes charge at Madrid.

PRESIDENT G. W. HUDDLESTON, of New York; treasurer, E. A. Godding, of New York; D. G. and C. C. Edwards, of Providence, R. I., of the Sultana M. Co., are visiting the mines of the company at Angels, Cal.

Commercial Paragraphs.

W. H. CHRISTIE has removed his office from 314 Pine St. to 615-16 Hayward Bldg., San Francisco, Cal.

THE Union Ore Extraction & Reduction Co., Denver, Colo., say they have installed their new plant and are now running full in every department.

F. C. COOLEY has been appointed agent General Chemical Co. of Chicago and New York, and Baker & Adamson Chemical Co., Easton, Pa., with office at 1752 Champa street, Denver, Colo.

THE Dyer Mill Co., 240 Montgomery street, San Francisco, Cal., are putting a cannon ball mill on the market that they say will work wet or dry equally well; also furnishing small mills for prospecting purposes.

THE Risdon Iron Works of San Francisco, Cal., report having sent the past week to the Tenderfoot G. M. Co. at Joseph, Or., a complete 20-stamp mill, with 1000-pound stamps, eight 6-foot Johnston concentrators, water power and a saw mill.

THE Paraffine Paint Co. of San Francisco, Cal., have moved to No. 24 Second street, where they now have more commodious office rooms, in keeping with the present expansion of their business. They have bought additional land adjacent to their factory site at Paraffin, near Emeryville, Alameda county, Cal., and have erected several large brick buildings and greatly increased their capacity for manufacturing P. & B. roofings, building papers and paints.

THE Pacific Gear & Tool Works has incorporated at San Francisco, Cal., and succeeds to the business and property of P. T. Taylor & Co. The incorporators are P. L. Bannan, president and manager; P. Lawlor, secretary; F. Gottfried, J. H. Folles, and T. Butcher. Their machine shop at 523 Mission street is well equipped with the latest milling and gear-cutting machines. As gearing forms a prominent part of the work done by the company, correspondence relative to same is solicited and estimates will be furnished.

Books Received.

"Electricity as Applied to Mining" is the title of a new book issued by D. Van Nostrand Co. of 23 Murray street, New York. It handles the subject systematically and thoroughly, from the first introduction of electricity in mining operations twenty-five years ago up to the present. The book is the joint effort of Arnold Lupton, G. D. Asplund, Paw and Herbert P. Kinn, noted electrical and mining engineers. It contains 170 illustrations and 280 pages. Bound in cloth. Price \$3.50.

Catalogues Received.

Catalogue No. 17 of the Weber Gas & Gasoline Engine Co. of Kansas City, Mo., in black and carmine, gives much information not only regarding that class of engines, but on gas power in general and its practical application. The cuts are new, the tables and descriptive matter well prepared, and 105 testimonials from pleased patrons give endorsement to the efficiency of their manufacture.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING FEBRUARY 17, 1903.

- 720,994.—MAP.—A. von Babo, Seattle, Wash.
 721,000.—R. R. SWITCH.—W. J. Bell, Los Angeles, Cal.
 720,889.—OIL BURNER.—A. H. Calkins, Santa Monica, Cal.
 720,895.—VISE.—E. R. Cook, Sacramento, Cal.
 720,783.—TELEPHONE MOUTHPIECE.—C. W. Clough, Watsonville, Cal.
 721,022.—HORSE CONTROLLER.—C. B. Corl, Riverdale, Cal.
 721,023.—GREASE CUP.—F. B. Cosper, Seattle, Wash.
 720,897.—MOTOR POWER.—F. A. Creed, Whatcom, Wash.
 720,799.—PLASTER.—H. M. Hammore, Los Angeles, Cal.
 720,814.—BRAKE BLOCK.—P. L. Jones, S. F.
 720,815.—SAWMILL.—W. E. Jones, Clear Lake, Wash.
 721,051.—TOY BALLOON.—A. J. King, Los Angeles, Cal.
 720,700.—GRAPPLE.—W. Kirry, Blue Lake, Cal.
 720,938.—SHADE BRACKET.—E. H. B. Lindhorst, Sacramento, Cal.
 721,067.—HOIST.—W. L. McCabe, Seattle, Wash.
 720,944.—SAW.—J. Meklejohn, Sedro Woolley, Wash.
 720,948.—DIEK PLOW.—J. P. Mulrony, Plaza, Wash.
 720,839.—HORSE BLANKET.—E. C. O'Neil, S. F.
 720,840.—LOADING DEVICE.—T. M. Park, Darrington, Wash.
 720,950.—LOADING DEVICE.—T. M. Park, Darrington, Wash.
 721,090.—WAVE MOTOR.—F. H. Reed, Claremont, Cal.
 720,853.—ROCK CRUSHER.—Spargo & Rose, Doble, Cal.
 720,750.—WATER WHEEL.—E. E. Speigle, Stockton, Cal.
 720,984.—TACKLE BLOCK.—A. H. F. Stranh, Portland, Or.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

WAGON BRAKE BLOCK.—No. 720,814. Feb. 17, 1903. P. L. Jones, San Francisco, Cal. This invention consists in a means for mounting the block upon a supporting and actuating shank, with a spring-adjusting attachment therefor, and means for regulating and limiting the movement of the block upon the shank. This device may be equally well attached to iron or wooden brake blocks and may be fitted to blocks of any size, the spring being, as before stated, reversible, so that one pattern serves for both right and left slides, and the movement of the brake block is limited in both directions by the lugs and adjusting screw. The wide lower end of the collar forms a sufficiently long bearing of the screw to prevent its becoming loosened in its threads by its use, and this portion also serves to steady the brake block or plate and prevent its tilting or wobbling upon the shank. The lugs at opposite ends of the screw prevent its working out and being lost.

ATTACHMENTS FOR HORSE BLANKETS.—No. 720,839. Feb. 17, 1903. E. C. O'Neil, San Francisco, Cal. The object of this invention is to provide a simple, durable and adjustable securing device by which the blanket may be held down over a horse's rump to prevent the blanket being disarranged or blown off when the horse is exposed to winds or storms. The novelty of the device resides particularly in the position of the points of attachment of the strap, and means by which the strap ends are resiliently supported in order to allow the blanket to be quickly put on or taken from the horse and to accommodate for the natural movements of the horse while blanketed.

CONCAVES FOR ROCK CRUSHERS.—No. 720,853. Feb. 17, 1903. John D. Spargo and G. W. Rose, Doble, Cal. This invention relates to improvements in rock crushers of the gyratory type, and pertains particularly to the concaves or grinding surfaces thereof. It consists in making these concaves rectangular or with parallel side edges instead of wedge-shaped and employing keys to lock the concaves together, said keys being wedge-shaped and having their lower ends thicker than their upper ends. When a set of these concaves have become worn at one end, the concaves may be reversed, thus effecting a saving of practically one-half in the expense of maintenance of a breaker. In mining operations where low milling expenses are of importance this saving becomes appreciable.

ANTISEPTIC ATTACHMENTS FOR TELEPHONE MOUTHPIECES.—No. 720,783. Feb. 17, 1903. C. W. Clough, Watsonville, Cal. The object of this invention is to provide a device which can be quickly attached to any ordinary mouthpiece, which shall in no wise interfere with the transmitting quality of the telephone, and which shall have the property of destroying bacteria and other germs expelled by the breath. These bacteria and germs often render promiscuous use of telephones a menace to health. The invention consists of an antiseptic or sterilizing adhesive water-soluble or other means of attachment to the mouthpiece than its inherent adhesiveness.

Latest Market Reports.

SAN FRANCISCO, Feb. 27, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22s 3d (standard ounce, 925 fine); New York, 48¢; refined (1000 fine): San Francisco, 48¢; Mexican dollars, 38¢ @ 39¢ San Francisco, 38¢ @ 39¢ New York.

COPPER.—New York: Standard, \$12.62½; Lake, 1 to 3 casks, \$13.12½; carload lots, \$12.75; Electrolytic, 1 to 3 casks, \$13.37½; carload lots, \$12.50; Castling, 1 to 3 casks, \$12.75; carload lots, \$12.50. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18¢ @ 24¢. London: £59 1s 3d spot per ton.

Copper, as predicted, has reached and passed the 13 cent mark in New York, and, judging from the condition of the market and what can be learned of supply on hand, the price is likely to go higher. It is stated that there is not over a single month's supply on hand; but this is not considered a surplus.

L. Vogelstein of New York City furnishes the following figures of German consumption of foreign copper for January-December, 1902, compared with the same period of 1901 and 1900:

	1902.	1901.	1900.
Tons.	Tons.	Tons.	
Imports.....	80,417	63,155	88,108
Exports.....	8,903	10,277	10,960

Foreign.....71,514 52,878 77,146

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots, 4½¢ 1000 to 4000 lbs.; pipe 5½¢ sheet 6, bar 5½¢; pig, \$4.75. London: £12 3s 9d per long ton = 2.610 per lb.

SPELTER.—New York, \$5.05; St. Louis, \$4.60; London, £21 10s per ton; San Francisco, ton lots, 6½¢; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½¢; Hallett's, 8½¢; San Francisco, 100-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13¢ @ 15c.

TIN.—New York, pig, \$29.50 @ 29 75; San Francisco, ton lots, 31c; 500 lbs., 31c; 200 lbs., 31½¢; less 32c; bar tin, 31c @ 37½¢. London, £133 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19.00; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75¢ @ 80¢ per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots: London, £8 15s; San Francisco, local, \$45.00 @ 46.00; 70¢ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½¢; extra, 17½¢; genuine, 35c; Eclipses, 37½¢.

ALUMINUM.—New York, No. 1, 99¢ pure ingots, 35c; No. 2, 90¢, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.65c.

NICKEL.—New York, 50¢ @ 60c @ 70¢; ton lots, 45¢ @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$23.10; gray forge, \$20.50; San Francisco, har, 3c @ 3½¢ in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$24.50 @ 25.00
Foundry Northern 1.....	23.00 @ 24.00
Northern 2.....	22.50 @ 23.50
Northern 3.....	22.00 @ 23.00
Southern 1.....	23.35 @ 23.85
Southern 2.....	22.85 @ 23.35
Southern 3.....	22.35 @ 22.85
Forge.....	21.85 @ 22.35
Charcoal.....	26.00 @ 27.00
Billets, Bessemer.....	33.00 @ 34.00
Bars, iron.....	1.75 @ 1.85
Bars, steel.....	1.75 @ 1.80
Rails, standard.....	28.00 @ 30.00
Rails, light.....	34.00 @ 40.00
Plates, holler.....	1.90 @ 2.00
Tank.....	1.75 @ 1.80
Sheets, 26 store.....	2.90 @ 3.00
No. 27.....	3.00 @ 3.10
No. 28.....	3.10 @ 3.20
Angles.....	1.75 @ —
Beams.....	1.75 @ —
Tees.....	1.80 @ —
Zees.....	1.75 @ —
Channels.....	1.75 @ —
Steel melting scrap.....	17.50 @ 18.50
No. 1 railroad wrought.....	18.50 @ 19.00
No. 1 cast, net ton.....	17.50 @ 18.00
Iron rails.....	24.00 @ 25.00
Car wheels.....	23.00 @ 23.50
Cast borings.....	10.25 @ 10.50
Turnings.....	14.00 @ 14.50

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25¢ @ 26c @ 30¢; carloads, 24¢ @ 24½¢; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½¢ @ 3c @ 4c; caustic soda, in drums, 3¢ @ 4c @ 5c; Cal.

s. soda, bbls., \$1.25 @ 1.50 @ 100 lbs.; aka., \$1.05; chlorate of potash, 12¢ @ 13c; nitrate of potash, bbls., 8c; caustic potash, 10c in 40-lb tins; borax concentrated, 7¢ @ 8c @ 100 lbs.; roll sulphur, 4¢ @ 5c; powdered sulphur, 2¢ @ 3c; flour sulphur, French, 2¢ @ 3c; alum, \$2.00 @ 2.25; California refined, 2¢ @ 2½¢; sulphide of iron, 9c @ 10c; copper sulphate, 5¢ @ 7c; chloride of lime, spot, \$3.00 @ 4.00; sulphuric acid, in carboys, 66¢ B, 2½¢ @ 3c; nitric acid, in carboys, 8c @ 9c.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (1st prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15¢; less than one ton, 17¢. No. 1*, 60%, carload lots, 13¢; less than one ton, 15¢. No. 1** 50%, carload lots, 11¢; less than one ton, 13¢. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2*, 35%, carload lots, 9c; less than one ton, 11c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 725 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10c @ 12c; 14 oz., 40s., 9c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmore, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Lined, boiled, hbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½¢; Astral, 22½¢; Star, 22½¢; Extra Star, 25½¢; Ecocene, 24c; Elaine, 27½¢; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½¢; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½¢; 86° Gasoline, bulk, 21c; do., cs., 27½¢; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½¢; c. Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50¢ @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50¢ @ 55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½¢; in 25-lb. tin pails, 7c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 7c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6c; do. in kegs, 6½¢.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½¢.

LITHARGE.—Pure, in 25-lb. bags, 8¢ @ 9c per lb.

BONE ASH.—Extra No. 1, 5¢ @ 6c per lb. No. 1, 4¢ @ 5c.

BORAX.—Concentrated, 7¢ @ 9c per lb.; powdered, 9¢ @ 12c; fused, 25¢ @ 30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ 5c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5¢ @ 7c.

MANGANESE.—(90% and over) 7¢ @ 11.25.

MOLYBDENUM.—25c. 3/4 gramme; 1000 grammes=2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, 7¢ @ 11.25.

MERCURY.—Bichloride, 7¢ @ 10c, 80c.

PHOSPHORUS.—(American) 7¢ @ 11.00.

SILVER.—Chloride, 7¢ @ 11.00; nitrate, 55c.

URANIUM.—Oxide, 7¢ @ 11.25.

ZINC.—Metallic, chemically pure, 7¢ @ 11.25; dust, 7¢ @ 10c; sulphate, 7¢ @ 10c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

WANTED.—PROSPECTORS AND LEASERS on private estate in California, 20,400 acres. Timber and water plentiful. The "GREAT STONEWALL" mine which has produced two million dollars on grant, which has never been prospected. For particulars, address

S. H. LUCAS,

CUYAMACA, CAL.

MINING AND SCIENTIFIC PRESS

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Usefulness of the Arrastra.

The most primitive mechanical device in the way of quartz-crushing machinery is the arrastra. In principle it is simple; in operation slow, but effective. It is the favorite resort of the miner who has rich gold rock but limited means to equip his property with machinery. The arrastra is usually built of stones—bottom and sides, and large hard rocks are selected to perform the function of pulverizing the ore introduced into the arrastra basin. Although simple in construction, the amount of material crushed and the percentage of extraction varies greatly with the same ore, depending on the experience or incapacity of the man in charge. He who does not know from careful instruction or long experience the secrets of the arrastra will crush much less and save much less than he who is familiar with its details of construction and method of operating. One important thing is to so dispose the "drags" that every portion of the basin is covered by each revolution of the upright shaft to which the "drag" arms are attached. Another feature worth remembering is to hang the "drags" by chains in such manner that their forward edges are slightly elevated, permitting the pulp to readily pass underneath. Some construct the basin with flat bottom, others incline the bottom from the center outward, and others from the edge toward the center. It is a close gold saver, and will often amalgamate an ore which cannot be satisfactorily amalgamated in a stamp battery, because of the condition of the particles of gold which are coated with silica or mineral oxide. This the abrasion of the arrastra quickly removes, brightening the gold and making it easy to amalgamate.

The arrastra has been usually the first "mill" introduced in new high-grade western camps. Often in the southwest, particularly in Arizona, New Mexico and southern California, these useful primitive quartz mills have been and are still numerous. They

may be operated with the minimum amount of water, and in many places large numbers of them may be found in a better or worse state of preservation, in the neighborhood of streams or springs, though no mines are near. Water being scarce at the mines the ore has been packed several miles to the arrastras located near the water. In Riverside county, California, there are over 100 of these old arrastra beds in the Gavilan district, grouped about springs.

The accompanying engraving is of a series of arrastras at Guanajuato, Mexico. Each arrastra is operated by a mule (blindfolded). This is the universal custom, as it has been found that animals will work more steadily while walking in a circle when blindfolded than otherwise. The ore is introduced to these arrastras through a hopper from a car running over-

head along the entire series. There are no arrastra establishments operated in the United States on so large a scale as the one illustrated here, but the arrastra is found in the Southwest running by gasoline engine, by steam and water power, as well as by animal power. So satisfactory is the arrastra in its work as a gold saver that the principle of its operation has been introduced into various forms of continuous crushing rotary mills. The principal difference between an arrastra and a Chilean mill is, that in the latter solid wheels of stone are substituted for the flat drags of the arrastra. These wheels are placed on a rigid axle, and in making a revolution of the basin the wheels grind as well as crush the ore. The Chilean mill also has its imitators in iron and steel. They are suited to fine crushing and grinding.

The capacity of the arrastra, like all other quartz-crushing machinery, depends on many factors. The most important are the size and construction of the arrastra, and the friability of the quartz, and to a great extent upon the size of particles introduced into the bed. Very hard quartz will crush much more readily if first calcined.

In the process of calcination the water contained in the rock, penetrating every microscopic crevice and vesicle, and often forming an essential part of the rock itself, is expelled. It is supposed that the pressure of steam generated by the application of heat causes the rock to disintegrate to a great extent, making subsequent pulverization comparatively easy. The burning also oxidizes the sulphides, thereby rendering the gold susceptible to amalgamation, and for this reason ore containing sulphides should be roasted.



Arrastras at Guanajuato, Mexico.



The Congress Mine of Congress, Arizona. (See page 153.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Arrastras at Guanajuato, Mexico.....	145
The Congress Mine of Congress, Arizona.....	145
Power Plant for Electrolytic Production of Potassium Chlorate at Haut, Savoie, Switzerland.....	149
Type of Generator at La Praz, Switzerland.....	149
Plan of Double Track Gravity Tramway.....	162
Side Elevation of Gravity Tramway.....	162
Head Frame Congress Mine, Arizona.....	153
Mining and Metallurgical Patents.....	153-164
The Armstrong Universal Ratchet.....	154
EDITORIAL:	
Usefulness of the Arrastra.....	145
Location by Agent.....	146
The Copper Market.....	146
Silver in Mexico and China.....	146
Annual Assessment on Oil Claims.....	146
Mining Bureau Bill Killed.....	146
A Customs Circular of India.....	146
Merger of Lead-Silver Mines in Idaho.....	146
An Eight-Hour Bill for Underground Mine Workers.....	146
MINING SUMMARY	156-156-157-158-159
LATEST MARKET REPORTS	160
MISCELLANEOUS:	
Concentrates.....	147
The Assayer—His Uses and Abuses.....	148
Copper Output and Prices.....	148
Why Some Mines Employ Incompetent Miners.....	148
Electrolytic Power Plant at Chedde, in the Alps.....	149
The Auriferous Zone of Georgia.....	149
Treatment of Homestake Ores.....	150
The Superficial Enrichment of Tailings Dumps.....	151
Refining Gold by Electrolysis.....	151
Cananea Copper Mines.....	152
Tramming by Gravity.....	152
The Congress Mine, Congress, Arizona.....	153
No Competition Among Gold Miners.....	153
Mining and Metallurgical Patents.....	163-164
The Armstrong Universal Ratchet.....	154
Personal.....	159
Commercial Paragraphs.....	159
Books Received.....	160
Catalogues Received.....	160
Obituary.....	160
New Patents.....	160
Notices of Recent Patents.....	160

Location by Agent.

Prospectors going into the newly discovered placer mines of Tanana district, Alaska, are complaining, it is reported, that Tanana creek and its tributaries are located from end to end by those first on the ground, who have taken up claims in the name of friends and relatives in the capacity of agents. This is just what may have been anticipated, for there is nothing in the Revised Statutes that prohibits one from securing a mining claim through the instrumentality of an agent. The title to mining property comes through compliance with certain conditions defined by the mining law, and one does not necessarily have to take the initiatory steps in securing the claim in person. In many cases the person in whose name a location is made may be totally ignorant of the transaction, but the law presumes that the act is done with his knowledge and consent, upon the general principle that a party is presumed to assent to a deed or other act manifestly in his interest. Claims so taken are subject to the operation of assessment and other laws governing mining claims the same as any other claims, and in the event of the failure to comply with the laws the claims may be taken by others.

As most mining properties in these days depend to a great extent upon the investment of large sums of money in equipment, and development for success, and as the individual prospector or investor is sometimes unable or unwilling to provide these essential factors in the conduct of the business of mining, the law permitting the taking of as many claims as one can properly "represent," or develop and exploit, seems to be not unwise. There are few syndicates or associations of large means which care to invest in a single claim, though eventually it is often found that the principal values are obtained from a single location. As a means of protection against the possible encroachment of neighboring interests, and also in the hope of extensive ore deposits being found, a

large area of ground is preferred by large investors.

With few exceptions those who are the first to reach a newly discovered mining field rarely are the ones to realize the greatest benefit from the dangers and hardships encountered. It is those who come later that have the better opportunities.

The Copper Market.

As predicted in these columns some weeks ago, copper has not only reached 13 cents per pound, but has passed that point, sales having been made in New York, the past week, at 13.75, and it is now safe to predict 14 cents copper within a reasonably short time, as there is nothing in either the market, the present production of the metal, the stock on hand or the wants of consumers to anticipate lower prices, for, in fact, a consideration of all these conditions plainly suggests the probability of higher prices. The rising price of the metal stimulates production, of course, but most of the large producers that can make profit at present prices are in operation, as well as some that are operating at a small loss. The range in price since 1898 has been notable, though being on an average about 12 to 13 cents. The lowest price within the period mentioned was 11 cents, obtaining in February, 1898, and the highest, 19½ cents, in April, 1899; but the fairly high price throughout this time has proven a great stimulus to the active development and equipment of copper properties, and no period in mining history has seen so many and such large undertakings inaugurated as within the period named. The wide range in price during the years mentioned has been due partly to manipulation by large interests, and partly to the natural course of events in the markets. At the time of the organization of the Amalgamated Association, April 29, 1900, with a capital of \$75,000,000, it was pointed out by the MINING AND SCIENTIFIC PRESS that this amount of capital was insufficient to control the copper market of America, to say nothing of dictating the price for the world. There were too many large conflicting interests—a struggle to sell all the copper produced, and no fixed price could be maintained.

While much distrust seems to have been engendered among large sellers of copper by the failure of certain producers to report their production according to understanding or agreement, or the suspicion that some others rendered fictitious reports, this seems to have been overshadowed by the actual operation of the laws of supply and demand, and under the stimulus of a heavy and continuous demand the market price is steadily advancing.

Silver in Mexico and China.

The gradual depreciation in the price of silver to its present value of 48½ cents per ounce has done much to stimulate gold mining. The sanguine ones who long hoped for better prices have long since given up that hope, and nothing now is anticipated for silver in the way of better prices. Mexico and China are striving to make some arrangement which will be advantageous to them. In the proposition recently submitted to the United States they practically ask that Mexico, and other countries desiring to do so, shall issue a new silver currency at the ratio of about 32 to 1, this currency to be maintained at a stated value by the governments interested controlling the quantity of currency coined and abolishing free coinage. These coins shall be accepted for public debts at gold parity, a gold exchange fund being maintained at the capitals of the countries entering into the agreement. The silver dollar of the United States, though containing only about 37 cents worth of silver, is maintained in value in this manner. Of course, in governmental transactions silver is not exchangeable for gold, excepting at hullion rates. The United States is only requested to give its moral influence to the plan, and not to enter into it further than that. Were Mexico, China, Siam and other countries at present giving serious consideration to their monetary systems to adopt the gold standard, it is difficult to say what effect it would have on the money markets of the world. It is doubtful if there is at present sufficient gold in existence to make this practically possible, and, in view of this fact, the proposed plan of Mexico and China seems to have much to recommend it.

Annual Assessment on Oil Claims.

Congress has had under consideration for some time an amendment of the law relative to annual assessment work on oil mining claims where the same are taken up under the revised statutes as placer mining claims. The bill as amended provides that where oil claims are located as placer claims the annual assessment work may be done upon any one of a group of claims lying contiguous, and owned by the same person or corporation, not exceeding five claims in all, providing that the labor will tend to the development or determine the oil-bearing character of such contiguous claims. The law now requires that upon each mining claim there shall be performed each and every year at least \$100 worth of work. The courts have held, with reference to lode mining claims, that this assessment work may be performed upon any one of the group of claims when it can be shown that the work is done to the direct benefit of all the claims in the group, but the land department of the Government seems unwilling to accept this ruling, and seems to be of the opinion that the annual labor upon placer mining claims must be done upon each of said claims. The bill passed the House of Representatives December 6 and is now before the Senate. It is believed it will pass the Senate without change. The necessity of such an amendment to the law is apparent, and is of great importance to the oil mining industry.

Mining Bureau Bill Killed.

A bill introduced in the Oregon Legislature creating a mining bureau, for the investigation and advancement of the mining interests of the State, passed both the Senate and Assembly, but was vetoed by Governor Chamberlain as too drastic in its provisions. The bill made the chief executive of the new department of mines not only an official whose province should be to investigate and report upon the mineral resources and industry of the State, but it also made him virtually an inspector of mines who would have authority to enter mines at any time, and approve or condemn methods of operating, machinery employed, etc. The leading mine owners and managers of the State petitioned the Governor to veto the bill, which, upon investigation, he did. A mining bureau, created solely for the purpose of investigating the mineral resources of the State, with the publication of official statistical and technical, as well as practical information concerning the same, would be of great value to Oregon, as it is to any State, but the need of an inspector of mines is not apparent. There are inspectors in several of the mining States, and there is about an equal number without them. Results do not show that mines are managed more carefully, or that there is a lesser number of fatalities—to the number of men employed—in those States having inspectors than in those operating without them.

THE government of India has issued a customs circular reducing the duty on crude petroleum having a "flashing test" of 150° or over to 5% ad valorem, provided it can be shown that the oil is to be used for fuel only. That there is any necessity for so high a "flashing point" has not been shown, though, as a matter of course, affording far greater security to the users of the oil. Millions of barrels of oil are annually consumed in safety where only ordinary precautionary measures are taken, the flashing point of which is far below 150°.

THE local papers of Wardner and other towns in the Cœur d'Alene district of Idaho report the merger of the principal lead-silver mines of that section, in which the American Smelting & Refining Co. are said to be an important if not the chief factor. The control of the lead industry in the Cœur d'Alenes will probably result in an apportionment of the output and possibly also higher prices for lead, as this section of Idaho produces more silver-lead ore than any other district or State in the Union.

AN attempt to pass an eight-hour bill for the benefit of underground mine workers in the Idaho Legislature was defeated in the Assembly, though passing the Senate. A similar bill became a law in Utah.

CONCENTRATES.

A DIRECT CURRENT of 500 volts would probably prove fatal to a human being.

SHELLAC makes an excellent insulator on wires of a newly-wound armature.

A DYNAMO will light from eight to twelve 16-candle power lamps per horse power; approximately allow 53 watts to each lamp.

AN object glass whose focal length is 72 inches, with an eyepiece of 2 inches focal length, will magnify an object thirty-six diameters.

A MINING LOCATION made on unsurveyed public land is valid. But a valid homestead location can not be made on unsurveyed public land.

THE longest electric transmission in the world is that of the Standard Electric Co. and Bay Counties Power Co., in California—220 miles.

MINERAL WOOL is mostly made from slag. About 40% of the annual product is derived from natural rock. About 4000 tons of mineral wool are yearly produced from slag in the United States.

A YELLOW PINE LOG has a resisting power to end crushing of from 4700 to 9800 pounds per square inch. Spruce ranges from 5000 to 7800 pounds, but spruce timbers will outlast yellow pine in resisting decay from effects of underground conditions.

TWENTY ONE minerals are known to contain zinc, but few are commercially valuable, their order of production being sphalerite, smithsonite, zincite and calamine. Not more than six minerals contain tin; cassiterite, the tin oxide, furnishing all the metal produced.

THE Catlin shaft, near Elandsfontein, Rand, is 8x28 feet, and 3950 feet in depth—the deepest in South Africa. At that depth the rock temperature is 80° F. At Turfontein a diamond drill struck the reef at a depth of 4800 feet, and a shaft is now being sunk to that depth.

CHILLED CAST IRON can be drilled if the chill is drawn. This can be done by laying the piece to be drilled in the forge, covering the spot to be drilled with sulphur and working the bellows slowly until the sulphur is burned off, when the drilling can be proceeded with.

FISH PLATES are advisable on outside tracks where there is heavy tramping; but underground, where the cars hold less than one ton and the tramping is done by men, they are an unnecessary expense. If the ties are substantial and good-sized spikes are used when the track is laid.

IRON SULPHIDES suspected of containing gold may be tested by giving the material a thorough roasting and subsequent grinding in a mortar with water. The gold may then be generally seen on panning, but even this test is not positive, as the gold may be present but be too fine to be seen.

SELENIUM is not a common mineral. It is reported to have been first discovered in the flue dust of the lead chambers of acid works in Sweden. In its properties selenium resembles tellurium. When heated it gives forth an odor resembling decaying borseradish. Arsenic when heated smells like garlic.

AN undeveloped mine must necessarily be an uncertain venture no matter what its surroundings may be. Each mine must make its own record and depend wholly upon its own resources, though frequently much consideration is given adjoining property, in placing a valuation on the undeveloped mine.

RAWHIDING is the principal means of ore carriage in the big places in British Columbia. The sacks of ore are securely enclosed in a rawhide and this is dragged by a horse over the snow. In the Lardeau particularly they accumulate their ore and wait for the deep snow and baul in the rawhide as described.

STEAM HOSE may be employed in connection with steam sinking pumps in mines; but "slipjoints" are superior, as the hose, if not kept under constant pressure, vulcanizes and becomes brittle, beside leaking badly at the couplings, and this leaking is difficult to stop. The pump can be handled better with the slipjoint.

THE ores of nickel number twenty-five, copper nickel, niccolite, the silicate, garnierite, millerite, nickel sulphide and smaltite, cobalt glance, furnish most of the nickel of commerce. There are ninety minerals containing iron. The oxides (hematite, limonite and magnetite) furnish nearly all the iron smelted from the ores.

APLITE is dike granite of uniformly fine grain and consisting of quartz, orthoclase and some plagioclase with little or no mica. Sometimes the masses are large, and in some instances quartz almost wholly replaces all

other constituents, forming a rock resembling quartzite. Rare instances are reported where this rock is gold bearing.

STEEL has been employed in sustaining mine workings, and under ordinary conditions answers admirably, but it is doubtful if its employment in swelling ground would be found satisfactory, as steel is rigid and will not bend, thus giving warning of the threatened collapse, which, should it occur, could not be anticipated as is the case where timbers are employed.

THE Colorado State mining law provides that no location certificate shall claim more than one location, whether the same be made by one person or several, and if it purport to claim more than one location, it shall be absolutely void, except as to the first location described, and if they are so described that it cannot be determined which was first located, then the location shall be void as to all.

STANNITE (tin sulphide) is comparatively rare, but occurs in some Cornish tin mines, and has been reported from the Etta tin mine, Black Hills, South Dakota, in small quantities. In New South Wales, at Howell, tin occurs as sulphide, associated with copper, iron and other metals associated with galena, zinc blende, mispickel and silver sulphide, generally in a gangue of crystallized quartz.

A SAFE AND SIMPLE TEST for cement is to sift 3 or 4 ounces of the cement through a standard test sieve of 100 meshes per linear inch. Reject cement of which 10% by weight is retained on the sieve. Many Portland cements are on the market which will leave less than 5%. A standard barrel of cement contains 3.65 cubic feet. The average weight of a cubic foot of Portland packed cement is 110 pounds.

THE public mineral lands of the United States, both surveyed and unsurveyed, are open to location by citizens of the United States and those who have declared their intention to become citizens, subject to such regulations as may be prescribed by law and subject also to the rules, regulations and local customs of the miners in the several mining districts, so far as the same may not conflict with the laws of the United States.

THE assay ton on the grain basis was used long before the introduction of the assay ton based on gram weights. Formerly the assay weights used on the Pacific Coast were grains—ten grains being divided into a thousand parts. As it used to read, "1000=10 grains." Thus a weight of 291.66 grains represented an assay ton; .01 of one grain an ounce Troy. J. S. Phillips describes this in his book, first edition printed about 1869, and was in use long before.

THE use of man engines in mines, though introduced early in Cornish mines, were first put in in the Hartz in Germany in 1833, the deep George adit having made two water wheels and pump rods available for the purpose; they were provided with steps and band holds. The next one was put in in the Duke George William shaft in 1838. The first in England was put in in 1842 at the Tresavean mine; the second in 1845 at the Great United mines at Gwennap.

IN SAND, silica is the fire-resisting element—it has no binding property—so that in a sand where adhesiveness is required alumina must be present; silica alone is very refractory; in the presence of the fluxing elements, iron, lime, magnesia, soda and potash, it readily fuses and forms silicates; these silicates fuse or melt at the following temperatures: Silicate of alumina, at 4350° F.; of magnesia, 3960° F.; of lime, 3810° F.; of iron, 3270° F.; of soda, 1600° F. The more lime or alkali present the more easily the sand is converted into a slag.

BLASTING in shafts by the use of the galvanic battery is now successfully accomplished by employing what are termed "delay fuses." These are fuses which require time—the fraction of a second—to cause an explosion. By this means "cutting bores" may be fired first, the intermediate "sinking holes" next and the "squaring-up" bores last. The great damage to timber often resulting by the simultaneous discharge of the full round of bores is thus avoided to a great extent, and the miners do not have to run the risk incident to "spitting" a large number of bores.

IN order to prevent excessive condensation of steam in pipes, the pipes should be covered with some non-conducting substance. For this purpose several varieties of material are manufactured. They are usually molded in cylindrical form, divided in half, and may be quickly placed on the pipe and secured with metal bands. It is estimated that the amount of condensation to a square foot of exposed steam pipe is equal to about eighteen pounds per hour, with steam at 100 pounds, this varying somewhat with the outside temperature. When the pipe is properly covered this loss is reduced to about four pounds. Steam pipes conducted into mines should always be protected in the manner described.

THE gold minerals number but a half dozen, by far the greater part of the metal produced is from the native. Fully forty minerals contain silver, but the production of the metal is mainly from native silver, from argentite,

proustite, pyrrargyrite and stephanite. There are ten minerals from which mercury is extracted, but the one ore, cinnabar, is accountable for seven-eighths of the world's production. There are about 100 minerals containing copper, but five-sixths of the world's production is produced from native copper ores, from the carbonates (malachite and azurite) from the sulphides, chalcocite, chalcocite and tetrahedrite and the oxide cuprite. Upwards of seventy-five minerals contain lead, 90% of the metal produced is derived from the sulphide, galena, while the carbonate (cerussite) is chiefly accountable for the remainder.

MINERS who have learned their craft in a single district usually have much to learn when going into a different State or district remote from their former home. The rocks may be different, the ores different, the character of the mines very different, and necessarily the methods of working also different. In some districts the most ordinary-looking stone is a valuable ore, yet the same appearing rock in another district may be valueless. As examples of this fact, some of the rich gold rock found in the Randsburg, Cal. district would not be given any attention in northern California. In Calico, Cal., ordinary-looking sandstone, jasper or spotted rhyolite, showing no indication of value to the inexperienced eye, carry payable and occasionally high values in silver chloride. In Lawrence county, South Dakota, chert, such as may be seen commonly in limestone, is in some instances rich in gold, and white friable quartzite is rich in silver. One cannot afford to pass hasty judgment on rocks; their appearances may prove deceptive.

SHOULD a vein of valuable mineral be discovered on railroad land, the first step is to ascertain if the railroad have a patent to the land. If they have, the proper course is to buy it from the railroad company. If they have not patented it, the land is subject to location. If a portion of the vein is on government land and a portion on railroad land, and the land is patented, by posting a notice of discovery at some point on the vein where it appears on the government land the locator is entitled to all that portion of the vein lying without the railroad grant, both on the surface and in depth. When the railroad company or the agricultural claimant obtains a patent to land, the patent guarantees to the holder thereof not only the surface of the land, but also all lying beneath it to the center of the earth, but these rights are bounded by planes drawn vertically downward through the boundary lines, and the locator of a vein on government land outside the railroad or agricultural patent may work all of the vein excepting the portion included within the vertical planes established by the boundaries of the railroad or agricultural land.

A WATER PRESSURE of 500 pounds per square inch is too great for domestic or fire purposes. The only practical and satisfactory manner in which this pressure can be reduced to one suitable for this purpose—say 150 pounds—is by the construction of a large tank at the proper elevation—about 345 to 350 feet above the datum plane—and tap the main line at this place, providing a good sized pipe, about 4 inches under the heavy pressure above it, and placing in a good gate with large wheel, or lever for opening and closing, as the pressure at this point will be about 350 pounds per square inch, and on the disc of a 4-inch gate would aggregate about 4375 pounds. In case of fire, the tank being full, an immediate supply is available, and a man may be sent to open the gate at the pressure tank. The ordinary fire hose will stand 200 pounds pressure and more when new. The distance to which water may be projected from a nozzle depends upon the pressure at the nozzle. Right angled turns in pipe lines should be avoided, as they greatly retard the flow of water and are likely to leak badly. The percentage of friction in pipes varies with the size of the pipe, being proportionally greater in small pipes, and also with the velocity of the stream. A 2-inch hose and inch nozzle are only serviceable for use inside buildings, and would give no satisfaction for general fire protection.

THE laws concerning the appropriation and use of water are not altogether satisfactory nor always as clear as might be wished, but in this regard the laws of California provide as follows: The right to the use of running water flowing in a river or stream, or down a canyon or ravine, may be acquired by appropriation. The appropriation shall be for some useful or beneficial purpose, and when the appropriator or his successor in interest ceases to use it for such purposes the right ceases. The person entitled to the use may change the place of diversion, if others are not injured by such change, and may extend the flume, ditch, pipe or aqueduct by which the diversion is made to places beyond that where the first use was made. As between appropriators, the one first in time is the first in right. The appropriator must post a notice at the point of appropriation and this notice shall state the uses to which it is intended to put the water and place of such use, also the size of the flume, ditch, pipe or aqueduct. Actual work must commence within sixty days from date of location and be continued uninterruptedly until completed. A locator cannot claim a larger amount of water than he actually appropriates from the stream. The owner of a ditch has no right to shut off the water legally flowing into the ditch of another. If he is injured by the appropriation of water by another from the same stream he has recourse in the courts.

The Assayer--His Uses and Abuses.

Written for the MINING AND SCIENTIFIC PRESS by
DAVID ATKINS.

Unless he is honest, the assayer is of no use whatever. His accuracy may be proved, to commence with; his quickness is obvious; but, if he does not bold his results inviolable, neither accuracy nor quickness are worth a cent.

Perhaps every assayer has faced the day when his tailings sample went higher than his ore, and, knowing that the part can not be greater than the whole, has wondered what to do. On the surface of it his position is one that promises little credit either way. He may either lie, and know himself a fool, or tell the truth, and give others that impression. But it is the man who writes down what his balance tells him who is worth his place. It may be that he has erred—assayers are human, after all; but, if he erred, nothing in the world is better than his discovery of it. A good man seldom errs twice in the same direction. There is a possibility that his tools are at fault; that his balance indicates its own sweet will, and a variable will at that; or that he is not allowed to use clean crucibles. Then let him say so. There are unquestionably bad balances—balances that are worn out and balances that were never broken in; and as for using dirty crucibles, the practice is as reprehensible as using unsterilized tools in an operating room. Any apparently foolish result that betrays the unreliability of his tools or methods should be welcomed by the assayer. He is not at a mine, as a rule, merely to do a hard day's work and draw a salary, but to turn out accurate work. There are dumps of good ore, condemned as waste by some hasty assayer, that will stand for long years as a monument to his carelessness. If a man's tools will not do him credit, he should have the pride of any honest craftsman and protest.

But it is to be borne in mind that the assayer, even if he is honest, quick and accurate—the perfect assayer—stands for nothing more than the value of his sample. He does not, and can not, say: "This result shows the value of your ore," but: "This result shows the value of your sample," unless he has done the sampling himself and has some understanding of the art. To blame him for another man's poor sampling is one of his commonest abuses. The art of sampling, as it is understood by more than one foreman, is embodied in the old classic:

He stuck in his thumb and pulled out a plum,
And said: "What a good boy am I!"

But, because the pudding is not all plums, the directors will ask: "Who is that assayer they have up there? Here are his samples averaging \$10 a ton, and the mill returns only showing \$2.50. We must get another assayer. Now, I have a nephew just out of college, etc." Here the assayer is abused for the carelessness of the sampler, and as often as not for the errors of the directors and stockholders themselves, who have a bewildering habit of striking averages without considering what amounts are represented. If the face of a drift give two samples, one showing a value of \$19 per ton and the other of \$1 per ton, the average value of the ore coming from that drift is not necessarily \$10 per ton. There may be only 6 inches of the \$19 ore and 66 inches of the other. It is not the assayer's fault that the ore in reality is only worth \$2.50 per ton.

It should always be remembered that assaying is the last of a series of acts going to determine the value of the ore, and is dependent on each previous act. There are superintendents who prepare elaborate statements showing the weight of ore crushed and its value, who show also the weight and average value of their tailings, who have no scales on the property. They estimate the weight of the ore, and then multiply this guess by the assay value. The weight of their tailings they estimate by subtracting the weight of concentrates saved from their first guess. Then, if Providence does not interfere on behalf of the poor assayer and throw up a coincidence, he stands the blame. If it's to be a guessing game, it might as well be left to the secretary in the city. Other interesting results are obtained by taking a lump of ore from each car and calling it a sample, or by weighing the ore wet, assaying it dry, and then multiplying the weight of wet ore by the assay value of the dry. Because the mill can not do conjuring tricks like this, it is hinted that the assayer is a fool or the millman a thief.

Of course, assayers are underpaid; we all are in these days of unions, when the bricklayer and plasterer are earning \$5 to \$7.50 a day; but the remedy is with themselves—though where assayers are being turned out in thousands, it is a very good man who can force the hand of his employer.

These are the most common abuses of the assayer; but there is yet another, which shows itself in the most fiendish variety, but for purposes of consideration may be classed under a common head: It is that of giving the assayer an incompetent superintendent. This is obviously unjust. The superintendent who on being told by his miners that all his mine needed was a

good gouge to break to, and who replied that he would "send to the city for one immediately," is a dangerous man to have around. It was such a one quite recently who dismissed his assayer because he found out that his plate tailings and his concentrator tailings, when added together, came to more than the value of his ore. He did not consider that the value of his final tailings was included twice in the total which appeared so large, and, moreover, he could not be brought to see it. In this case the superintendent was a wise man from the East who had given up a flourishing grocery business to take a turn at mining. It is from these that the assayer seeks for cover.

Having considered the abuses of the assayer, now let us, from the employer's standpoint, consider his uses. The average mine without him is as dangerously situated as a ship without a compass. There are exceptions, of course; for just as the ship that sails away in sight of land is independent of its compass, so the mine that yields free-milling ore may feel its way along by faith and panning.

Primarily, the assayer is at a mine to do the assaying, and to do it accurately and quickly; but his functions need not stop here. If there are means of weighing the ore, let him prepare a monthly chart, showing the disposition of the values, though it should be remarked that such a chart must not be expected to tally to a cent. As St. Peter protested, when St. Paul threw double nines from his dice box: "No miracles between friends!" With ordinary methods of cleaning up, where it is not economy to recover all your gold, since some is absorbed by the plates, and some retained in the batteries and even in the quicksilver, it is vain to expect anything more than an approximation. This chart should show the number of tons of ore crushed and the average value, the number of tons and the value of the concentrates saved and the value of the tailings. It may be asked: "What are his uses, if he can not tell us whether we have all the bullion which belongs to us at the end of the month's run?" These are his uses: To pass upon new ground, as the inspectors pass upon immigrants; to watch the pickpocket tailings like a detective, and when he catches this thief in the act to find out how it happened; be should strip and sift and identify and mark the characteristics; be able to tell you whether your thief is slimy, coarse or greasy; whether the loot is concentrates, gold or amalgam. These are uses enough.

Let your assayer, then, where it is practicable, have overcharge of the mill. A superintendent is none the less in charge who intelligently delegates his authority. Indeed, the successful manager is the man who can free his mind from routine duties to attend to larger questions. Many a man instead of directing is being driven; overburdened with detail, he does the "next thing," whether it is best or not he has no time to ask. And while this delegation of authority frees the manager, it also stimulates the subordinate in no small measure, for there is no spur to effort like responsibility. The assayer, then, should be encouraged to voice his opinion of the milling—not necessarily to the millman, who has as a rule too many masters, but to the superintendent, from whom it is better that all interference should come.

In a going concern, where the ore is fairly stable in value, it may be economy to let the mill samples accumulate for two or three days; for, if one is getting at average values, one obtains the same result from a three-day sample as from three daily samples assayed separately and averaged, and obtains it at less cost, while the labor and money saved might be spent to better advantage in prospecting the mine.

Since, as has been said, the assayer is responsible only for the value of his sample, he should have charge of the sampling in the mine, under the direction of the superintendent or foreman, and would be responsible from start to finish.

If possible, give your assayer time and a trifle of latitude for experimenting. A man who is kept down with litharge, soda and honeash and what flour he can get from the cook, is apt to become a rule-of-thumb man and lose his faculties through disuse.

Copper Output and Prices.

Following is a table of copper output in the United States from 1887 to 1902, inclusive:

	Tons.		Tons.
1902.....	293,830	1894.....	158,120
1901.....	266,716	1893.....	147,033
1900.....	270,588	1892.....	154,018
1899.....	261,313	1891.....	126,839
1898.....	235,050	1890.....	115,966
1897.....	219,481	1889.....	101,239
1896.....	202,235	1888.....	101,054
1895.....	170,137	1887.....	81,017

Following are the highest and lowest prices (in cents per pound) reached by Lake Superior copper in each year of the same period:

1902.....	13.00	1894.....	10.10
1901.....	17.00	1893.....	12.20
1900.....	17.00	1892.....	12.25
1899.....	19.25	1891.....	15.00
1898.....	13.12½	1890.....	17.05
1897.....	12.00	1889.....	17.50
1896.....	12.00	1888.....	17.60
1895.....	12.30	1887.....	17.75

Why Some Mines Employ Incompetent Miners.

Written for the MINING AND SCIENTIFIC PRESS by CHAS. L. LANG.

The poet has declared that "civilized man cannot live without cooks." It is no less true that mines cannot be worked without miners, and it is sometimes not so easy to get them if the mine is unfortunately situated at great distance from the main mining centers.

Much happier is the superintendent or foreman whose operations are conducted in close proximity to the large mining towns, where good accommodations, excellent food at moderate prices, including all the pleasures and allurements dear to the heart of the careless, free and generous toilers from under the surface, make these places a natural magnet, holding within its attraction a continual surplus of first-class men from whom to pick and choose.

But very often nature places a mine in some isolated, forsaken spot, many days removed from even a postoffice, reached only by a long stage or buckboard ride, and often nothing but a tortuous, zigzag trail up rugged summits and down dark canyons, until the dump of tunnel or shaft is seen, bidden amongst the brush and timber, or perhaps standing out against some barren, rocky ridge, wind-swept in winter, or baked by summer suns.

Not much amusement or excitement in a place like this; no wonder that there is dissatisfaction. A dirty bunkhouse, usually alive with bedbugs or worse, three rows of bunks, one over the other like those in the steerage of a ship, is something of a contrast to the hard-finished room with clean bed, mirror and washstand, chairs and carpet, the commonest "mucker" can command in any mining town. At the boarding house there is the usual mixture of chickory and ground peanuts for coffee, bread half baked or else burned and sour, leathery pie crust made of rancid lard and filled with prunes; cake made without eggs, bull butter good and strong, and condensed milk blue and weak; pasty wheat mush, a vile imitation of nutritious oats, with the inevitable sodden hot cakes that require a specially prepared gastric juice to digest. All these things have a tendency to make the miner, accustomed to better things, long for the "flesh pots of Egypt," so to speak, and the first pay day, if he has the endurance to wait that long, sees him wending his way to the settlements, or to some neighboring mine whose reputation for "setting up good grub" is an inducement to change not to be resisted, although its drifts and stopes may be wet, the foreman a "devil's own pusher" and "a crank from way back."

Now, these out-of-the-way mines must be worked as well as mines in or near the towns, but it is a notorious fact that wages alone will not attract good miners to them, as many prefer to lie idle for months rather than accept immediate employment at an "outside" mine.

A crew of poor miners means slow and expensive mining work. It is gradually filtering into the brains of those who own mines in remote and isolated places that men who can command employment by reason of their extra skill are not often compelled to travel in search of work. They will not run the risk of extra hardship, the curtailment of appetites and pleasures, therefore the creature comforts of employees must be considered even if it does entail what may seem unnecessary expense. Acting on this idea the modern superintendent no longer huddles his men together in a bunkhouse; small cabins are built instead, usually 10x12 feet in size, furnished with bedsteads, wire and woolen mattresses. Each cabin is occupied by two men. (Cottages are erected for men with families.) By this arrangement men working on the night shift are not awakened or annoyed, and the day-shift men are not disturbed by the night-shift that comes off of the mine in the early morning.

Reading or club rooms are now built at many mines; these contain a large heating stove, plenty of strong chairs, a long, plain desk, with inkstands and penholders, magazines, mining, sporting and daily papers, card tables, and even a graphophone, the value of which cannot be described in words, for it affords to some extent the relaxation demanded and needed by all who perform heavy and continuous physical labor. This idea is well known to professional athletes; the "Varsity coach" always tries to keep his men in good humor and to select a low comedy man as one of his team, for he knows that the depressing influences exerted on the mind by severe training reacts on the muscles.

Nothing is ever lost by judicious kindness; it is always repaid with heavy interest, no matter what the sour or selfish cynic may say. It is strict business economy to see that your men are well housed, well fed and contented. Improved physical condition means greater capacity for work—and here you have your reward. This principle is carried out in the intelligent handling of animals. Why should they be better used than men?

The writer well knows that "some men would growl though they were to be hanged." But dis-

criminating kindness is not weakness, and a hearty friendliness can be maintained between employer and those who labor without stiff-neckedness on one side or by encouraging the familiarity which is said to breed contempt on the other.

Sonora, Cal., February 7.

Electrolytic Power Plant at Chedde, in the Alps.

Written for the MINING AND SCIENTIFIC PRESS by
FRANK C. PERKINS.

During the past few years there has been a great development of electro-chemical work, both in this country and in Europe. A large number of hydro-electric power plants have been utilized for supply-

The installation at Chedde contains twelve Girard horizontal turbines built by Brenier & Neyret of Grenoble. They each have a capacity of 800 H. P., making a total output of 10,000 H. P., and the total cost of the hydraulic plant was 140 francs per horse power at the turbine shafts. The electrical equipment of this power station consists of four Oerlikon generators, four Belfort machines, and four Thury 8-pole dynamos, the latter having each a capacity of 560 K.W. These machines supply a direct current of 800 amperes at a pressure of 700 volts, the speed being 240 revolutions per minute. These generators may be seen in the foreground of the accompanying illustration (Fig. 1). The electrical equipment of this plant cost 210 francs per horse power and the efficiency of the generators is 95% and that of the turbines 75%. It is stated that the cost of the power per annum at the dynamos is but a trifle over \$4 per

the "white coal" of the Alps for the production of chlorate of potash by the electrolytic process may be mentioned those at St. Michel and Vallorbes, as well as the Usine de Gavet-Clavaux and the Usine de Monthey (Suisse). In this country as well as abroad special electrolytic generators, transformers and other apparatus for use with electric furnaces have been produced by the leading manufacturers. The accompanying illustration (Fig. 2) shows one of the 12-pole direct current machines built by the Cie de L'Industrie Electrique de Geneva, Switzerland, for the Usine de la Praz for the reduction of aluminum. These machines supply 3000 amperes at a pressure of 110 volts, and operate at a speed of 250 revolutions per minute. The plant at La Praz utilizes a total of 8600 H. P. and is operated by the Societe Electro-Metallurgique Francaise. There are also two machines at this plant, each of which supplies 7500 amperes at a potential of 35 volts, the speed being 300 revolutions per minute. Generators of this type are also employed at St. Michel de Maurienne, France.

The Auriferous Zone of Georgia.

Written for the MINING AND SCIENTIFIC PRESS.

The gold-bearing formation in Georgia occupies fully one-third of the area of the State, and, with the exception of about 3500 square miles in the northwest corner, includes the entire State north of a somewhat irregular line from Augusta on the eastern border to Columbus on the western side. This line is the southern boundary of the crystalline area and marks the head of navigation on the rivers, which generally run from north to south. The area here defined may be considered as mica schist, for though there are intrusions of granite and other rocks, the proportion is very small.

The strike of the country rock extends from northeast to southwest, and the veins from which most of the gold has been obtained are parallel with each other in belts which follow the strike of the country rock, and vary in width from 1 to 6 miles. The two great belts are about 25 miles apart and extend from the northeast corner of the State to about the middle of the western boundary line. The belts continue into North Carolina and Alabama, and in the eastern part of the State, about 30 miles north of Augusta, a continuation of a South Carolina belt enters and extends southwest about 40 miles.

The veins are separated from each other in the belts by spaces that vary from 30 to 40 feet up to several hundred feet and rarely cut across the country rock, but are between the planes of the schist and follow its dip and strike. Miners who are disposed to be theoretical would probably change their ideas here about fissure veins, for though these veins conform to the planes of the schist and have no walls, they hold their value in depth. Such a mine is now worked here at a depth of 1300 feet.

The small veins are quartz and the large ones are made up of alternate streaks of quartz and mica schist. The latter are often of great width and are of course low in the value of gold per ton. Denudation has proceeded to a great extent, and the veins can easily be traced on the surface or found by digging a few feet. The placers that came from the decomposition of the veins, as also the free-milling ore that could be found in them, have been worked out and the sulphide ores remain for development.

The veins of Georgia have ore shoots and lean places, like veins in other countries, and the average value of the ore shoots is probably from \$5 to \$7 per ton in gold, which is about the only metal saved here, though some of the veins have considerable value in copper. Lead and silver are not important values.

The dullness in the gold mining business of Georgia is shown by the low price paid for labor. Good miners, white and black, work here with hammer and drill ten hours a day for \$1.25 and with this support themselves and families. There are opportunities here, either on a large or small scale, for those who have capital and thoroughly understand the mining and milling of gold-bearing ores. It is probable that the sulphur in the gold ores of Georgia will have a value as a by-product which can be used in the manufacture of phosphate fertilizers. At present pyrites are brought from Spain and other countries to Georgia to be used in this industry. Gold-bearing ores can be mined here and the values extracted by any process, except smelting, for one-half to two-thirds of the cost of the same work in the western part of the United States. Mining land in Georgia is also farm land and must be purchased from individuals, all the public lands having been disposed of many years ago. The title is from the State of Georgia as one of the thirteen original sovereign States and there are no extralateral rights.

There is a smelter at Atlanta that is well equipped to reduce ore or concentrates to copper matte, but there are no stamp mills, concentrators or chlorination works for custom work, and a miner must also be a mill man and have the capital to build his own mill. As is usual in mining districts, there are stamp mills idle here which have been built by persons who know but little about gold mining, and, as is the custom with such people, they have put up their mills and then proceeded to look for ore.

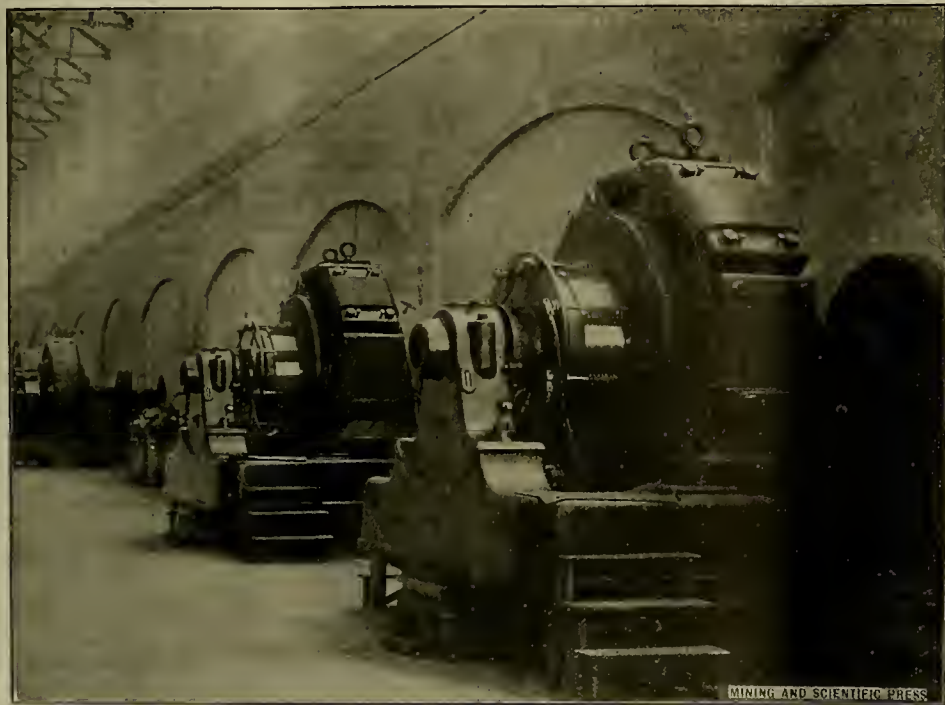


Fig. 1.—Power Plant for Electrolytic Production of Potassium Chlorate at Haut, Savoie, Switzerland.

ing the necessary current, and at no place has this source of energy been so extensively utilized as in France and Switzerland. The "white coal" of the Alps is now being employed for this work to a great extent, the melting ice and snows of Mont Blanc and other high peaks furnishing water power, which is well sustained through the dry season.

The river Arve supplies about 10,000 H. P. for the production of carbide and chlorate of potash, the power being generated at the works of Chedde, in the commune Passy, department of Savoie. The power house is located in the valley of Chamonix, near the junction of Sallanches. The water is conducted from the river Arve through a large tunnel 288 meters in length, and then another tunnel of 505 meters, at the end of which there is a direct fall of 39.05 meters to the power house in the Ravin du Chatelard, where four turbines of 1300 H. P. operate generators which supply current for an electric railway in the mountains. The water, after passing from the tail race of this power plant, enters a tunnel 672 meters in length, at the end of which there is another direct fall of 139.05 meters to the power house of MM. Corbin & Co. At this plant the water is carried through two steel pipes 1.4 meter in diameter and 400 meters in length. The wrought iron pipes are 15 millimeters in thickness near the turbines and 5 millimeters in thickness at the beginning. The water is carried a total distance of nearly 1800 meters by canal, and it will be noted is utilized in two different power stations.

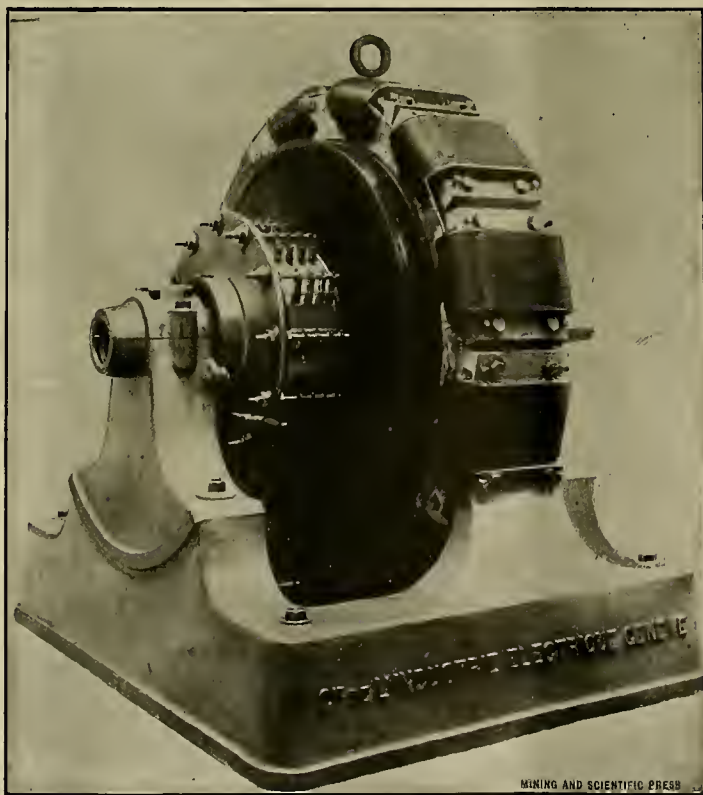


Fig. 2.—Type of Generator at La Praz, Switzerland.

horse power. The energy is utilized not only for the electrolytic production of potash, but also of soda, by the Gall-Montlaur-Corbin process. This electro-chemical plant is said to produce 1,500,000 pounds of carbide and 9,000,000 pounds of chlorates per year. The chemical works cover an area of 13,000 square meters, the largest building alone having an area of nearly 8000 square meters. Among the other important power plants using

Treatment of Homestake Ores.*

By C. W. MERRILL, Lead, S. D.

Before entering into the question of the metallurgy of the Homestake ore, I wish to invite your attention to the standards which I shall use in its discussion and which are as follows:

1. The U. S. gold dollar.
2. The U. S. ton of 2000 pounds.
3. \$20 67 per ounce of fine gold.
4. Percentages are by weight and not volume.
5. The sizings are based on the following: Coarse

is that portion of the sample which will remain on a 100-mesh screen, diameter of wire .00433 of an inch, size of opening .00575 of an inch square; middles being the material finer than the opening of the above 100-mesh screen and coarser than the opening of the commercial 200-mesh screen as given below; fines being the material which will pass such a 200-mesh screen, diameter of wire .00216 of an inch, size of opening .00312 of an inch square. A further subdivision of fines is also mentioned, which is based upon the granular condition of one portion and the amorphous condition of the remaining portion of these fines.

We now turn to the nature of ore. The Homestake lower level ore, which comprises the greater part of that now being milled at Lead, may be described as a hornblende garnetiferous schist or slate, which has been crushed and infiltrated with free silica and pyrites, the latter being about 7% or 8% of the ore, and comprising pyrite, pyrrhotite, arsenopyrite and traces only of chalcopyrite.

MILLING.—The ore receives its first crushing in rotary breakers at the hoists, and this product varies in size from that of sea sand up to rock having an extreme dimension of 4 inches. From bins at the hoists at Lead the broken ore is trammed to the three mills, i. e., the Homestake and Golden Star, containing 200 stamps each, and the Amicus (formerly the Highland), in which there are 140 heads, making a total of 540.

From the mill bins the ore passes to the mortar, which is of the now celebrated Homestake narrow pattern, where it is crushed between cast iron shoes and dies, the weight of the stamp when equipped with new iron being 900 pounds, the drop 10½ inches and falling eighty-eight times per minute.

The screen is of the steel needle-slot type, No. 8, and the bottom of the screen opening averages 10 inches above the top of the dies.

The long drop, high discharge and small area of screen opening produce an extremely fine pulp, about 80% passing a 100 mesh screen, and it is to me a most remarkable fact that under these conditions such a high stamp duty is maintained, it being fully four tons per stamp for twenty-four hours.

This duty is only possible because, first, of the very favorable nature of the ore, the slate and pyrite crushing readily and the quartz being an excellent medium of attrition; secondly, a large proportion of water is used, being from eight to ten times the weight of ore crushed, and thirdly, because of the narrow mortar, which is only 12 inches wide at the lip.

This very fine and thin pulp is in the most excellent condition for amalgamating, which process is conducted both inside the mortar and outside, on four full size plates, in series (54 by 144 inches by ½ inch), to each mortar. The first of these is a copper plate and the other three are silver plated copper, the weight of plating being two ounces per square foot, and all silver plating being done at the works. The addition of the three silver plates to each stamp battery by Mr. Grier, general manager, has proven one of the most valuable steps in the treatment of this ore, and has brought about an additional profit amounting to approximately \$250,000 during the year 1902, over and above what would have been realized from amalgamation had the outside plate surface been only that of the one copper plate, and which, by the way, is considered ample in many of the large modern plants of the day. In the judgment of the writer much more attention will ultimately be paid to amalgamation and finer crushing in South Africa, and that instead of obtaining from 55% to 60% there on the plates they will more nearly approach the Homestake yield of 70% to 75% by amalgamation and at the same time reduce the value of their cyanide residues. This is particularly true because in that country their slimes are of proven value sufficient for secondary treatment, while such has as yet not been proven at the Homestake, where the advisability of sliming such a large proportion of the ore has been a debatable point. But more of this will be said later.

In connection with amalgamation it should be said that experiments conducted here indicate very strongly that in the case of the Homestake ore the maximum yield on the plates is obtained when the temperature of the water fed to the battery is below 50° F.

The total cost of milling in the 200-stamp mills at Lead is approximately 40 cents per ton.

CLASSIFICATION.—We now have a pulp containing eight or ten parts of water to one of ore, and much of the latter is infinitesimally fine; so much so that

one gentleman, after watching an attempt to filter the slimes on a large scale, remarked that for an exemplification of the size of a molecule he advised the study of Homestake slimes.

The sizing test of the tailings as they leave the mill is about as follows:

Coarse, or that portion remaining on a 100-mesh screen 22%
Middles, or that portion between 100 and 200-mesh 18%
Fines, or that portion passing a 200-mesh screen 60%

That is, the cross-section of 60% of the particles issuing from the mortar is less than 1/1000 of a square inch in area.

Having outlined the metallurgy up to that point at which the secondary treatment begins, it may not be amiss to point out that when the erection of the cyanide plant had been determined upon, the question of a tailings wheel to elevate the pulp and enable the locating of the plant nearer the mills, being under discussion, it was figured out that to elevate the tailings at a cost of about 2 cents per ton would cost the company approximately \$140,000 on the proportion of the material then blocked out in the mine, which would be available for leaching. In other words, for every cent per ton which could be saved in the secondary treatment of the leachable material, the company would profit ultimately to the extent of \$70,000. It is perhaps superfluous to remark that the tailings were not elevated. Consequently the plant was located on its present site, and the problem of transportation and such classification as would permit the pumping plant to return its former percentage of water to the mills presented themselves. The latter has been met by the installation of the upper cone house, where twelve gravity settling cones, 7 feet in diameter and with 50° sides, throw off about one-half of the water and perhaps one-fifth of the solid matter, which latter is the very finest slime of the following sizing during 1902: Coarse 0, middles 1.76%, fines 98.24%. The slimes are subsequently settled out of this pulp and a part of the water returned to the mills.

From the bottom of the above cones is drawn the thickened pulp containing all of the leachable material and some of the slime. This portion is transported by means of a 12-inch cast iron flanged pipe, on a minimum grade of 2½%, and with as few turns as possible, to the cyanide plant.

The second step in the classification is carried out in the plant proper by means of six more gravity settling cones, the overflow from which, of a like composition to that of the first twelve cones, is conducted to a collecting tank, whence it is drawn for the purpose of sluicing out the leachable material after its treatment has been completed. The average sizing of this second settling cone overflow for 1902 was: Coarse 0, middles 1.38%, fines 98.62%.

The underflow from the second set of gravity settling cones, which is now quite thick, passes to twenty-four sizing, or hydraulic classifying cones, which carry a device for discharging the sand and introducing water, which the writer has patented. By its means the admitting of water does not result in currents of varying velocity, which latter always interfere with uniform separation of slimes from granular material.

These sizing cones complete the classification, which has been a difficult problem because, first, of the extreme fineness of the pulp, and secondly, because the writer was determined to avoid double treatment, which entails a largely increased installation and operating cost, but which is necessary unless a product practically freed from slime may be obtained.

The slime overflow from hydraulic classifiers had the following average sizing for 1902: Coarse 0, middles 1.46%; fines 98.45%. As regards all the slimes referred to, they will practically all pass the 200-mesh screen, the middles being largely wood pulp.

In fact there is little doubt but that the importance of the most perfect classification possible will be recognized shortly as a vital consideration in the cyaniding of wet-crushed ore, and metallurgists will not follow the old German practice of spitkasten and spitlutzen, which are very imperfect machines as compared with a cone classifier or sizer. The writer's judgment is that a scientific classification system, by which all the granular or angular material may go to the leaching vats and all the amorphous portion to the slime plant, will in the future be a feature in designing a plant on which the greatest care and experimentation will be put, and the highest grade of technical skill utilized.

By these three steps in the classification we have separated the pulp into non-leachable slimes, all of which will pass a 200-mesh screen, and a direct leachable product, which although very clean and free from mud, is still of a very fine texture, as the following sizing test, the average for the year 1902, will show:

Coarse remaining on 100-mesh 40.5%
Middles, 100 to 200-mesh 30.8%
Fines passing 200-mesh 28.7%

While you will note the fineness, we find that as the proportion of lower level ore increases we can treat an even finer product, a recent charge containing as high as 40% fines, which maintained our normal leaching rate of 3 to 4 inches per hour throughout the treatment. This is undoubtedly due to the fact

that the fines from the lower level rock contain a greater proportion of angular or granular material and a less proportion of amorphous or hydrated.

TREATMENT.—The leachable pulp, which contains 10% to 12% of pyrite, is now ready to go to the vats, and on the way lime is added in quantities varying from three to five pounds per ton. At first we tried adding this lime in the mill, as is done in Africa, but found that the amalgamation was most seriously affected thereby; not only was the plate completely coated, weeks being required to get it back in proper shape, but the tailings values were largely augmented. This result only emphasizes the fact that the process must fit the ore, and that attempts to make an ore fit a process are useless. This practice of adding lime to the battery is unanimously pronounced to work the best results in Africa and to reduce the values in the slimes lost from amalgamation to one-half of what they are when no lime is used in the battery. In our case, however, we have demonstrated that the best results follow from crushing the lime wet into a running pulp which joins that from the cones, whereby there is less slacking and less loss of flocculent lime in the vat overflow, i. e., in the water which overflows the vat, the sand having settled out. Not only is it of distinct advantage to have our lime go into the tank in unslacked granules, but recent investigations are proving that the average size of these granules has an important bearing on the subsequent cyanide decomposition. We are not prepared as yet to say what is the very best mesh screen to use on our lime stamp battery, but at present we are using a wire screen, the opening of which is ¼ of an inch square. In this connection it should be said that only the purest lime should be used, the magnesia in the ordinary dolomitic limestone being objectionable for several reasons.

The classified pulp and the lime pulp having commingled, the mixture passes to the distributor, which is of the garden sprinkler, or Butters & Mein type.

Of these distributors there are two, one for each row of vats, hung from a carriage which travels on a track and the step of which rests on the top of the center bottom discharge gate of each vat when the distributor is in operation. There are fourteen sand vats, each 44 feet in diameter, 9 feet deep inside, and holding 610 tons of sand. To fill one of these requires from eleven to eleven and one-half hours, which permits, with our equipment, of about five days contact with solution before it is necessary to recharge the vat. After filling, the drain valve is opened, the top leveled, and the stronger of the two stock solutions, of a strength of 0.14 of 1% KCN, is run on. The contact with this solution, including frequent drainages for the purpose of drawing in air, is maintained for about three days. The air contact is very important in Homestake ores, owing to the presence of pyrrhotite or sub-sulphide of iron, which absorbs oxygen with great avidity and which would greatly retard the dissolving action of the cyanide solution, were not quantities of this essential oxygen introduced. The effluent solution, during this period, having normally a strength of 0.10 of 1% of cyanide, is run to the weak precipitation tanks, of which there are two, each 26 feet in diameter by 19 feet deep, and holding 300 tons of solution.

After the three-days contact with strong solution, the weak solution, normally of a strength of 0.10% KCN, is brought into the charge and this contact is maintained for the remaining two days. The effluent solution from the charge during this period is run to the strong precipitation or rather collecting tanks, which are of the same size and number as the weak precipitation tanks.

After contact with the weak solution has been completed wash water is brought into the charge, and the washing continued until the effluent solution is down to 0.03 or 0.02 of 1% in KCN and from 5 to 7 cents per ton in value. The charge is now ready for sluicing, which operation is accomplished by two men with 3-inch hose, in about four hours, using the slime water from the overflow of the second settling cone. The four side gates and one center gate afford ample facilities for the discharging. The last inch or so of the sand is sluiced with clear water under seventy-five pounds pressure through 1½-inch hose, and the eight-ounce duck filter, under which is another of cocoa matting, is washed clean. The vat is then filled with water and is ready for the next charging.

PRECIPITATION.—As stated above, the effluent solution resulting from the leaching with strong solution is run to the weak precipitation tanks, and has a value of approximately \$2 per ton and a strength of 0.10 of 1% KCN. When one of these weak precipitation tanks is full the stream is turned to the other and the former is then ready for precipitation. It contains 300 tons of solution, which is brought into agitation by means of compressed air; and about sixty pounds of zinc powder in the form of an emulsion is sprayed in during the agitation. The pump, which is of the compound, duplex, outside packed plunger type, is then started and the mixture pumped through two large filter presses 36 inches square, of the flush plate and distanco frame pattern, containing twenty-four frames, each 4 inches in depth. The gold, silver and excess of zinc remains in the frame and on the cloth, the barren solution passing through the cloth and on to the weak solution storage tank below, which is the same size as the

*Transactions Black Hills Mining Association.

sand vats, whence it passes again to the sand as weak solution. Its value has been reduced by this operation from \$2 to 5 or 10 cents per ton, being a precipitation of 95% to 97½%. The efficiency of this method of precipitation lies largely in the fact that the cloths of the presses are coated with about ½ inch of powdered zinc and precipitate, so that every particle of solution having to pass through the cloths, gets a molecular contact with the precipitant, which is true of no other precipitation process. The presses are run without opening for a month, at the end of which period the press gauges show only about ten pounds pressure, notwithstanding the fact that they then contain about a ton of precipitate, worth about \$50,000. They are cleaned up by two men in about six hours, including the putting together with new cloths.

It is worth while in passing to suggest that figures covering the labor of cleaning up \$50,000 from zinc boxes or electrolytic precipitation would form an interesting comparison.

We must now return to the effluent solutions resulting from the contact of the tailings with weak solution during the latter part of the leaching, which effluent solutions are run to the strong solution collecting vats, which when filled are strengthened to 0.14 of 1% of KCN and pumped directly, without precipitation, to the strong solution storage tank, of the same capacity as the weak storage, whence it goes on to the early treatment of the charge as before mentioned. Its value is from 30 to 50 cents per ton. It will thus be seen that the strong solution of one day becomes the weak solution of the next day and that the values are all accumulated in the weak precipitation tanks. The strong solution thus has an approximately constant value; that is to say, only one-half of the total effluent solution is precipitated, the other half being kept at a constant low value.

REFINING PRECIPITATE.—As the refining of cyanide precipitates is of some importance owing to the well recognized losses which take place in the ordinary methods, which losses are from 2% to 6%, a description of the process we use at the Homestake, in which the loss is less than 0.1 of 1%, may be of interest. The precipitate after removal from the presses is treated first with dilute hydrochloric acid in a lead lined mixing tank equipped with a mechanical agitator, a hood and a powerful exhaust fan. After agitation and settling, the supernatant liquid is forced through a filter press by air pressure. Sulphuric acid is then added, agitation begun and the mixture heated. It is then settled and the supernatant solution put through the press as in the case of the hydrochloric acid. Wash water is then added to the mixing tank and the whole mixture put into the press where it is further washed. The resultant acid-treated precipitate is then removed to a large steam drier where a part of the moisture is expelled, but never all, and the precipitate mixed with litharge, borax, silica and powdered coke. When thoroughly mixed it is sprinkled with a solution of lead acetate and the whole mass briquetted under a pressure of 4000 to 6000 pounds per square inch. The zinc having been removed and the briquettes having been dried, a borax slag develops upon their outer surface upon being charged to the cupel and they fuse quietly, quickly and at a low heat, without dust or volatilization losses. The lead absorbs the values, sinking to the bottom, and the slag is tapped off. All of the slag having been removed, the lead is cupelled off as litharge and the resultant metal, 975 to 985 fine, is ready to run into bars. The cupel slag and the cupel bottom are then put through the blast furnace, the lead content of the slag reduces to lead which absorbs the values and is drawn from the lead well in the usual manner. This lead is returned to the cupel at the next cleanup, the litharge from the cupellation goes to the next precipitate and the blast furnace slag is worth less than \$5 per ton. The total cost of this refining amounts to less than three-quarters of 1%, so the Homestake Co. realizes \$20.52 per ounce for its cyanide gold, less the usual U. S. assay office charges on dore bullion, and the expressage to New York. These charges total between 10 and 11 cents, so that the net realization per ounce of fine gold precipitated is \$20.42 in New York exchange. A parting plant is now contemplated which will make a further saving in this connection and enable the company to turn out fine gold and fine silver.

Having now described the process in detail, let us turn to the question of tonnage, percentage and costs: The maximum monthly tonnage of this plant was attained in October, 1902, when 40,236 tons, or 1298 tons per day, were treated. This gives to the Homestake Co. the largest sand treatment cyanide plant in the world. The next largest being, I believe, that of the Simmer & Jack, in South Africa.

As a comparison of the various assay determinations and valuations which the bullion produces is always of interest, the following figures for the last half of 1902 are given:

Extraction—that is, difference between charge and residue assay multiplied by the tonnage, equals \$292,579.

Precipitation—that is, difference between assays of unprecipitated and precipitated solutions multiplied by the solution tonnage, equals \$301,233.

Gold in precipitate—that is, the assay value of the precipitate sampled upon removal from the presses, \$302,895.

Gold value of bullion shipped, \$307,635.

Silver value of bullion shipped, \$2874.

The average percentage recovered in bullion by the treatment for the past six months is 74.7%.

This is not as high a percentage by bullion as should be recovered from a porous or oxidized ore, or one in which the values are along cleavage planes.

But in view of the fact that such a high percentage is recovered by amalgamation, that the values are very finely disseminated in the Homestake ore, that the tailings are very low grade, we feel, and all our tests so far have verified our conclusions, that it is the economic percentage, that is, the percentage which yields the maximum net profit.

As to operating costs at the Lead cyanide plant, the following are averages per ton for the year 1902, during which time the average value of the sand treated was \$1.65 per ton:

Classification	\$0.017
Treatment — Cyanide	\$0.152
Labor	0.030
Lime	0.022
Supplies	0.005
Precipitation	0.209
Power	0.026
Water	0.051
A-saying	0.026
Refining	0.013
Miscellaneous	0.008
Total	0.005
	\$0.353

As compared with the above, the lowest costs I have seen authoritatively stated for other plants, are as follows:

City & Suburban, S. A.	\$0.55
Goldenhuis Estate	0.605
Goldenhuis Deep	0.62
Robinson	0.62
Worcester	0.72

These African costs refer, of course, to operations before the late war between England and the South African republics; but they are the only figures available to me, and I do not think they have been reduced materially since.

As regards the slimes, which are not at present being treated, their assay value ranges from 80 cents to \$1.10 per ton. I am not aware that even as low treatment costs as the gross value of this material have as yet been attained anywhere in cyaniding slimes, and yet it is a pleasure to be able to say that Mr. Grier, the general manager of the company, has evolved an entirely novel process which promises an economic solution of their treatment. The principle of his proposed method, when worked out in its practical details, will hold out a good possibility of revolutionizing the metallurgical aspect of cyaniding slimes, and may bring to the company another world's record.

The Superficial Enrichment of Tailings Dumps.

TO THE EDITOR:—As to the matter of surface enrichment, I refer to tailings dumps following cyanide treatment; although inclined to think that this would take place in any dump employing a chemical process, as, for instance, in the case of chlorination, bromocyanidation, or in the use of the hyposulphite of soda leaching process, since the values in all these cases exist in practically the same condition, so far as solubilities are concerned.

The matter is not a theoretical one entirely. It was first called to my attention some six years ago, while engaged in operating a tailings plant in Idaho. I discovered, mainly by accident, that tailings, the value of which I knew to be less than \$1.20 per ton, assayed from grab samples, taken from the surface of the dump at various localities, gave values not far from \$4 per ton (these figures are taken from memory, but may be taken as substantially correct). This state of affairs set me to thinking, but before I had an opportunity to investigate the matter I was called away to attend to other matters, and the affair was temporarily dropped. It might be well to add that the assay values of the tailings and the bullion shipments checked reasonably close.

Since that time, on several different occasions, have I noticed a discrepancy of this sort, but only within the past two years has an opportunity occurred to personally investigate the matter.

The results obtained, briefly stated, are as follows: I found samples taken from the surface of several cyanide dumps to carry values, in nearly every instance, in excess of the regular mill tails. I again take the precaution to state that the mill samples, in every case, checked the bullion and solution assays reasonably close, taking monthly averages.

An instance of enrichment occurred recently with which the writer was, in a general way, interested. It was in the case of the Mercur tailings which gave results so high, from superficial sampling, that the assayer became greatly alarmed, until the above solution of the problem was suggested.

In all these cases, and the writer refers only to those cases in which he personally took the samples, it was found that samples taken from about 2 feet beneath the surface gave normal results.

There seems to be little doubt, though I have never tested it, that these high values would cease at a much less distance from the surface than 2 feet,

from the very nature of the proposition, which in low grade tailings would not allow of extensive enrichment.

Very recently an engineer sampled the tailings dump of the Chairman mill, obtaining values far in excess of the actual value of the ore as brought to the mill from the mine. I believe that he took his samples from the surface of the dump, taking a sufficient number of samples to insure accuracy.

Of course the idea is, in a way, a theoretical one, but it is a theory which admits of no other explanation, so far as the writer has been able to determine.

WINTHROP H. WICKHAM.

Denver, Colo., Feb. 25.

Refining Gold by Electrolysis.

Practically all the gold produced by the mines of the world contains more or less silver, some of it a relatively large amount. Silver bullion containing a considerable amount of gold offers no unusual problem in metallurgy, but gold containing small amounts of silver and other impurities in its refining often costs more than the value of the substances separated from the gold.

The problem of refining gold bullion of this character has been solved by electrolysis and this method is now almost exclusively in use in the refineries of the country. As a result only the refined gold is now shipped to the mints and the consequent scarcity of silver has proven an inconvenience in the refining of gold containing small amounts of silver and other substances. By the acid method the gold bullion is alloyed with two and one-third times its weight of silver, and this after granulation is boiled in nitric or sulphuric acid. As a result of the small amount of silver sent to the mints, the same silver has to be employed over and over in the process, causing an unusual expense for acid. If the silver arrived at the mint in about the necessary proportion to the gold—that is two and one-third times as many ounces of silver as ounces of gold—the refining process would be less expensive.

The electrolytic process as practiced at the United States mint at Philadelphia, Pa., is described by D. K. Tuttle, melter and refiner at that institution, in *Electro-chemical Industry*, as follows:

The only process for directly refining gold electrolytically that is known to have been reduced to practice is that patented by Dr. Emil Wohlwill, Hamburg, Germany.

The feature protected by patent is the electrolyte. This is composed of gold chloride solution rather strongly impregnated with free hydrochloric acid, and it is in this latter point that the significance of the invention lies. If a gold anode be placed in a neutral or only slightly acid solution of gold chloride, opposed by a suitable cathode, gold will be deposited by an electric current, but little or no gold will be dissolved from the anode. Free chlorine is given off; a result not to have been anticipated since chlorine is an active solvent for gold. Upon the addition of free hydrochloric acid to the bath, a point is reached where the chlorine at the anode is suppressed and gold passes into solution, equivalent for equivalent, to that deposited. The strength of the electrolyte is easily maintained by such additions of gold chloride from time to time as will be equivalent to the copper, platinum, etc., dissolved from the anode and not deposited on the cathode. The operation is continuous until the solution becomes highly charged with impurities.

In the operation of the process the apparatus consists of first: A dynamo, which, when run at its normal capacity, requires 5 H. P. and furnishes a current of 600 amperes at six volts. The machine having been designed with a view to experimental work, a rheostat in the field winding enables us to regulate the current between 100 and 600 amperes.

Second: The cells, which are of white porcelain, are 15 inches long by 11 inches wide and 8 inches deep. These are filled with a prepared solution of gold tri-chloride containing 30 grammes of gold per litre (3½ Troy ounces per gallon), the depth of the solution being such as not to entirely submerge the anodes. In each of these cells are suspended twelve anodes and thirteen cathodes, in multiple. The anodes are 6 inches in length, 3 inches wide and ½ inch thick. The corresponding cathodes are of fine gold and rolled down to ⅓ of an inch in thickness. The distance between anode and cathode is 1½ inches. In our present working seven cells are placed end to end on a bed of sand, underlying which is a series of steam pipes by which the temperature of the bath may be raised and maintained at any desired degree. At present our cells are kept at from 50° to 55° C. The increased temperature serves to reduce the voltage required, and at the same time to diminish the amount of free acid necessary to suppress evolution of chlorine at the anodes.

Circulation of the electrolyte by mechanical means is necessary to secure uniform disintegration of the anode and deposition of the gold.

The seven cells in use are connected up, in series, with the dynamo, which is at present regulated to furnish 100 amperes. The tension between the terminals of the seven cells varies from four and a half

to five volts, dependent upon temperature, strength of solution, etc.

The chemical equivalent of gold is very high and the electromotive force required for the deposition of gold is very low, so that the power necessary for running the plant is insignificant. With only seven cells of our plant in operation, we are refining about 5000 ounces per week, with the expenditure of about 1 H. P. One attendant suffices to manage the work, with the occasional assistance of a second workman.

The cost of hydrochloric acid in the bath is 20 cents per 1000 ounces of deposited gold. We can increase our refining capacity to 50,000 ounces per week with our present plant.

Besides the advantage the process offers for the refining of gold with an insignificant consumption of acid, with little labor and small expenditure of power, an important one should be mentioned, viz., the recovery of any platinum present in the bullion. This dissolves, but is not deposited with the gold. When the electrolyte becomes sufficiently charged with platinum, the gold is first precipitated by sulphur dioxide and removed. Then the platinum remaining in solution is separated as ammonium platinum chloride. Lastly, the copper is recovered by passing the wash waters over iron scrap.

With these advantages to its credit, the process has limitations which are serious ones. Any silver in the anodes will, of course, be converted into insoluble chloride, and if the percentage be small will fall to the bottom of the containing tank as "slimes." But if the amount of silver exceed 5% the chloride tends to adhere to the anode, as a crust, which must be mechanically removed.

Furthermore, any considerable quantity of copper present in the bullion to be treated is undesirable, since the electrolyte, in that case, must be renewed inconveniently often.

There seems to be reason to think that any electrolytic process for parting and refining gold will not have the same success in this country in our industrial plants as it met in Europe. The Australian, South African and Hong Kong native gold is very much purer than even our California nuggets and they were very much better than our recent finds in Alaska.

Hong Kong gold is reported as containing .975 gold, .020 silver, .0005 platinum, .0005 iridium.

Some recent consignments of Klondike gold to this mint varied from .776 gold to .834 gold, .219 silver to .161 silver, with no showing of platinum or iridium in the electrolyte.

Such bullion can only be successfully treated by the "Wohlwill" process when blended with a higher-grade gold. We prefer not to treat bullion having a fineness of less than .940 gold.

Again, the Government conditions for the gold producer here are much more favorable than in other countries. At any United States mint or assay office the depositor is entitled to receive promptly upon assay of his bullion all the gold it contains in the form of gold coin or draft on the treasury, less some slight charges. If the amount of the deposit be large he may even receive an advance of 80% on its approximate value at the time of making the deposit. Under these circumstances the question of interest becomes an important item with the industrial establishments. With a given output per diem, several times the value will be locked up in solutions, anodes, cathodes and material in various stages of leaching, melting, etc.

Cananea Copper Mines.

TO THE EDITOR:—Now that W. C. Greene has disposed of his interests in the Cananea mines, some who are familiar with these famous producers of copper are wondering how the purchasers of them are going to profit by their investment. For some time the management of the Cananea mines has been contemplating and has partly attempted the most rigid economy. They have earned for themselves the reputation of being antagonistic toward laborers of all descriptions, and are in consequence suffering from the loss of the good will of their employees. In the West this is a serious matter to consider; in Cananea it is especially so.

When it is known that all the expensive construction work of the Cananea company has been completed the attempts at economy through the reduction of salaries and wages of American employees are looked at with distrust. It might indeed be wiser to abolish the system of employing Americans at American wages and employ Mexicans only in every department. That the company will ultimately substitute Mexican for American labor seems likely.

Appreciating the superiority of American labor the Cananea company is trying to secure it cheaply. Miners and mechanics from the United States are paid at the rate of from \$3.50 to \$8 gold per day, while Mexicans for similar employments receive from \$3 to \$5, Mexican money, per day. To abolish the difference the company assesses the American employees \$2.50 gold for hospital fees and \$2.50 gold for rent, and sometimes discharges them from employment after a service of from five to eight days. This would reduce the net earnings of the Americans to from \$1 to \$2 per day gold. The labor difficulty is the principal one in the way of the Cananea company. The epoch of favoritism is passed. No longer is

there seen in Cananea a boss to a man and a boss in a man's way. But this is only a small advance. If American labor in the great camp is to be supplanted by Mexican labor the bosses must be able to speak Spanish fluently. Usually the most competent mining and smelting officials are not versed in Spanish. At the same time that the Cananea mines must be worked by the cheapest kind of Mexican labor they must be supervised by expert mining men, and at the present time these two desiderata do not seem to be achieved.

The conditions of the mines themselves show why these things are necessary. According to R. Mitchell, general manager of the smelter, the productive capacity of the reduction plant of the company is 65,000,000 pounds of copper per year. Allowing that this is true, although it seems exaggerated, the value of the output of the Cananea company is about \$8,000,000 annually laid down at New York.

While W. C. Greene states that the company can produce copper at a profit of $\frac{1}{2}$ cents per pound the actual working test shows that ore carrying $\frac{1}{2}$ % copper can be worked barely at a profit.

The mines producing ore are the Elisa, the Capote

Tramming by Gravity.

Written for the MINING AND SCIENTIFIC PRESS

As mining regions are usually in a mountainous, or, at least, a hilly country, the problem of transportation is often a serious one from the standpoint of economy. The ideal condition or surroundings do not often obtain. A vein is usually discovered on the slopes or the summit of a hill or mountain, for the reason that the vein, if existing near the base of the slope, is often covered by the talus formed by the debris coming from higher points on the hillside. As the discovery is made at some high point, so the early development of the mine is likely to be done at or near the place of discovery. Mills or other works for the treatment of the ore are generally built at some lower point on the slope or in the gulch below. Often, to convey the ore from the mouth of the tunnel driven into the mountain, or shaft sunk on the vein, an expensive road is built from mine to mill or shipping station, and on it the ore is packed on animals or hauled in wagons. In other instances the

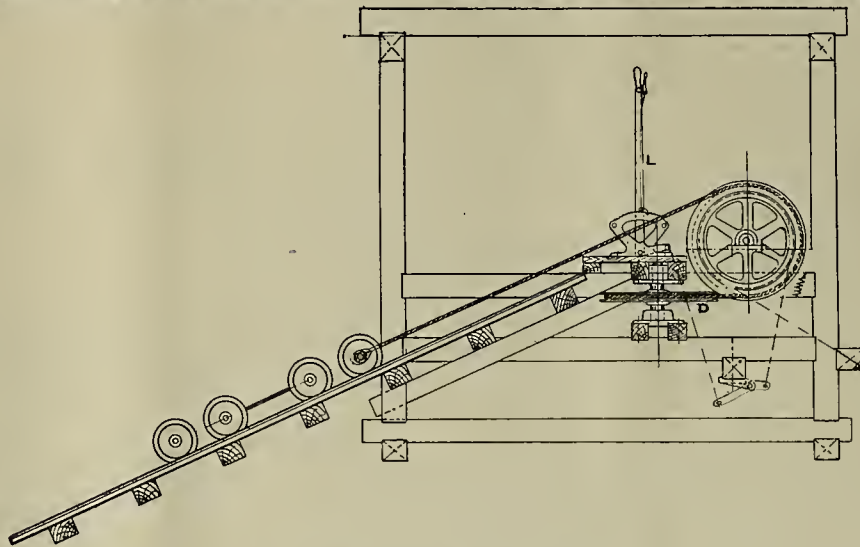


Fig. 1.—Side Elevation of Gravity Tramway.

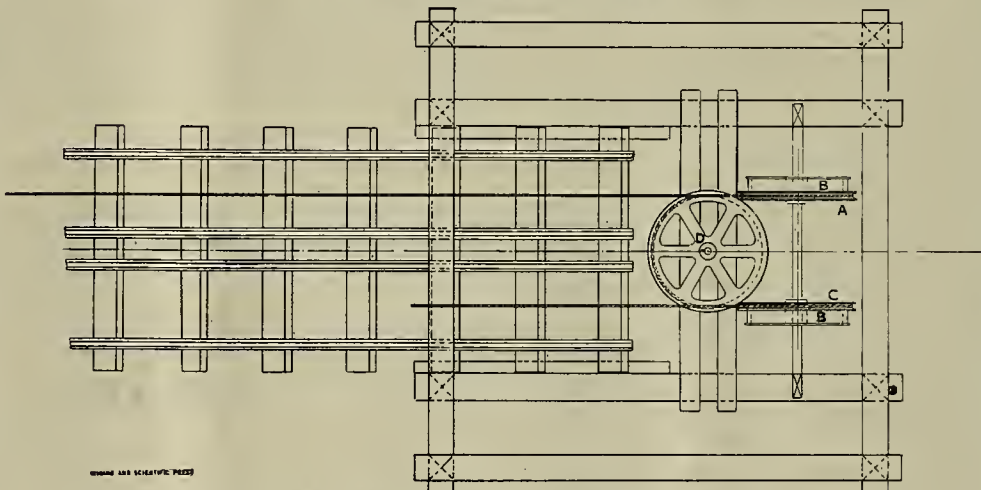


Fig. 2.—Plan of Double-Track Gravity Tramway.

and the Oversight. The Veta Grande and Cohre Grande are hut small producers comparatively. The Elisa yields 175 tons of ore per day of an average of 8% copper per ton, the Capote yields 725 tons of 6% ore, and the Oversight 300 tons of 10%. So difficult is the ore to treat, owing to the amount of siliceous matter in it, that it is necessary to use 300 tons of flux per day. This flux is barren of metal. Taking all in all the material treated by the Cananea smelter yields copper to the extent of 5.8% of the gross bulk. About 87 tons of copper is produced daily from 1500 tons of earth.

By shutting the Capote mine down and devoting every energy toward extracting the high-grade ores of the Oversight and Elisa, by good management 300 tons of 8% ore can be taken from the Elisa daily after extending workings in the mine for a period of six months. From the Oversight a production of 700 tons of 10% ore could be brought about in six months. But so great are the siliceous contents of the Oversight ores and the solfataric features of the Elisa ores, at least 500 tons of flux would be required in their treatment. At any rate, however, the results would be very advantageous to the company. In the contingency of both an increase in the copper percentage and an advance in the price of copper the company would be put on a very safe dividend paying basis.

But Mr. Greene has stepped out of the Cananea company's problem by turning it over to Rockefeller. Naco, Ariz., Feb. 28.

ore is shot down a long chute of lumber or through a good-sized pipe. When the tonnage to be handled is large and the country rough, aerial ropeways are superior to other means for transportation; but under ordinary conditions a grade may be made on a line joining the two points—mine and mill—on which a track may be constructed, the cars running by gravity, the loaded car going down developing sufficient power to haul the empty one up. The tracks may be built single with turn-out at the center; but this is not advisable, owing to interference of the ropes. The three-rail track is not uncommon and is in use at many places. This is also constructed with a midway turn-out. The most satisfactory track is double, with no turn out, and, consequently, no interference from passing cars, derailling on switches, etc.

Where the grade is heavy, some device must be built at the upper end of the tramway to control the cars, as the loaded car on starting down the incline may so nearly balance the empty car at the foot that it starts gently and moves with little velocity; but, as the loaded car passes downward, the distance between the empty car and the sheave at the head of the tramway grows constantly less, with accordingly less weight of rope, while the loaded car has an increasingly greater amount of rope and weight, and the speed is accordingly greatly accelerated.

Ordinarily the tramway rope is wound on reels similar to those in use on ordinary hoisting engines.

The accompanying sketches illustrate an ingenious method of constructing the upper station for double-

track tramway, whether built on the ground or on trestle. Fig. 1 shows a side elevation of the construction and Fig. 2 the plan of same. A and C are sheave wheels, running loose on the shaft but secured by collars at the side to prevent possible travel. B B are brake surfaces forming a portion of the sheave wheels. D is a third wheel disposed midway between A and C, but placed horizontally, as shown at D in Fig. 1. L is a lever connecting with the brake hands which operate on B B. The brake construction is also shown in Fig. 1. The rope attached to the car running on the track opposite A passes over A, half way around D and under C, and thence is attached to the second car. The sheaves and shafts are disposed and constructed as shown in the drawings. The frame should be solidly built and securely anchored. The cost of such head rigging on a tramway of this description is much less than where cylindrical reels are used.

A novelty in the operation of a gravity tram is in use at a slate quarry near Placerville, El Dorado county, Cal. The slate is quarried on the slope of a steep mountain side and is elevated several hundred feet on a gravity road to near the top of the hill, where the wagons are loaded. At this place the loaded car has to be hauled up. To accomplish this, on the track opposite the slate car, or "giraffe," is a four-wheeled truck, upon which is secured an iron barrel supplied with a valve at the lower end, operated by a projecting spindle, similar to valve hockets used in some mines. The quarry company own a ditch near the top of the tramway and from this fill the iron barrel with water. The weight of the barrel when full is sufficient to pull the "giraffe" loaded with slate to the upper station, where it is secured by brake until the load is removed. In the case of ore this might be accomplished automatically by dumping; but slate can not be handled in this manner. Upon the arrival of the water barrel at the foot of the incline, the spindle at the bottom of the barrel meets an obstruction which causes the valve to raise, the water escaping. The "giraffe," being heavier than the truck with its empty water barrel, upon being released, descends, hauling up the latter.

No practical use can be made of this ingenious scheme in sending ore down a gravity road.

The Congress Mine, Congress, Arizona.*

The illustration on page 145 gives an idea of what is going on at Congress, Arizona.

The Congress Consolidated Mines Co., Ltd., have recently started their new mill of forty stamps, making a total of eighty stamps. The engraving shows



Head Frame Congress Mine, Arizona.

all of their plants except three hoists, which are over the hill back of the mill. There is a tunnel 1200 feet in length running through the mountain and ore from these shafts is sent through the tunnel to the mill, and supplies for the shafts are taken on return trips. The treatment at the mill is wet crushing with stamps, followed by concentration on tables. The tailings are separated into two classes. The coarse sands are treated by the cyanide process and the finer material (slimes) is first roasted in mechanical furnaces and then treated by cyanide. As there is no free gold in the ore, plates are not used and no amalgamation attempted. The mill treats about 300 tons per day. Their water supply is obtained from Date creek and is pumped a distance of 8 miles and

raised 500 feet. They use about 100,000 gallons of water per day.

The deepest workings are now 3500 feet on the dip of the vein, which is about 22°. This is known as the Congress vein. They have two other veins approximately parallel, one of which is known as the Niagara. On this they have two shafts 3300 feet apart, one of which is down 1000 feet and the other 1300 feet, showing strong veins of normal grade at that depth.

The machinery used in and around the mine and mill is up-to-date and includes an air compressing plant. Machine drills are used in the mine—twenty-five in all. They own the railroad from the mine to the main line of the Santa Fe, Prescott & Phoenix Railway.

The company have completed a brick store and office building, which makes a great improvement to the town.

The ore is white quartz carrying iron pyrites. The average value of the ore is stated to be \$15 per ton. There is reported to be more "ore in sight" than ever before. There are 450 men employed at this property.

Under ordinary conditions, head frames at mines are not only located at the collar of the shaft of the mine, but usually at no great distance from the hoisting engines. Owing to the unusual conditions at No. 6 shaft of the Congress mine, the head frame herewith illustrated was particularly designed by the company's engineer. Manager W. F. Stanton describes the innovation in head gear and placing of power as follows: The shaft is 1300 feet deep, at an inclination of 45° to over 50°. The self-dumping skip is of one-ton capacity and travels in the shaft 1000 feet per minute. The engine is 900 feet distant from the shaft and 98 feet higher than the collar, and the line of rope leading from the engine makes an angle of 80° with the center of the shaft. The rope from the skip leads over the top sheave in the head frame, then straight downward to a sheave at the base of the frame, and thence over guide sheaves and rollers to the engine. Another peculiar and equally unusual construction of head frame is that at the Argonaut mine, Jackson, Amador county, Cal. At this mine the head frame in general appearance resembles that at the No. 6 shaft of the Congress mine. The shaft is inclined at 63° from the horizon. The "angle braces" are usually found on the side next the hoisting engine, and are designed to take the thrust, or resultant strain, the direction of which is about midway between the center of the shaft and the hoisting reel. In the case of the Argonaut frame, the "braces" are at the back of the structure, opposite to the engine, and to the casual observer serve no useful purpose. The

engine is nearly 200 feet distant from the head sheave and about 60 feet lower on the sloping hillside. The entire head frame is constructed on a level grade cut into the hillside, and the "braces" are heavily bolted to mudsills, the whole being weighed down with about thirty tons of old iron, rocks, etc. When this is understood, the construction of the frame is appreciated, though, at first glance, contrary to all recognized ideas of engineering.

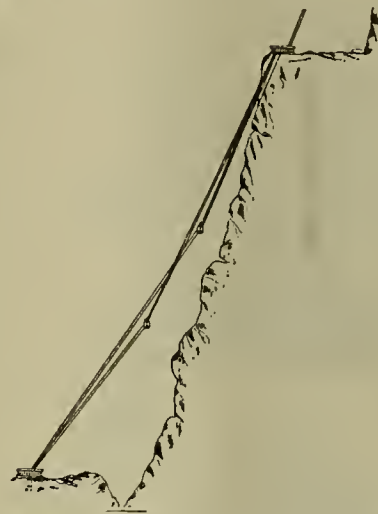
THERE is no competition among the miners of gold. There is no dread of overproduction, no fear of a fall in price. Miners of base metals have all of the annoyance and mischance that besets the gold miner, and the additional cares of competition and variable market.

Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 24, 1903.

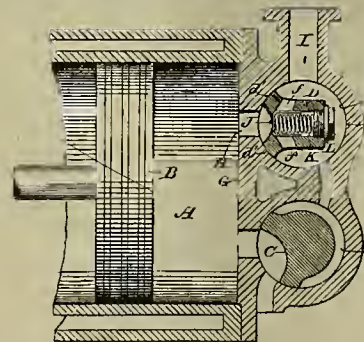
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MOUNTAIN ROPE LIFT.—No. 720,909; W. Feldmann, Elberfeld, Germany.



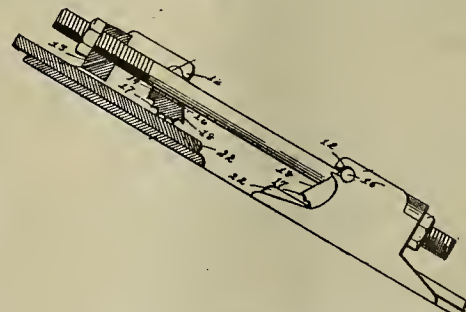
A rope lift or elevator provided with double or duplex supporting cable located in plane passing through center of gravity of supported car, each part of cable being adapted to independently support car and both parts thereof permanently secured at upper station and yieldingly connected together at lower station and to counterweight or mass in such manner that they are always maintained under constant tension.

DISCHARGE VALVE FOR COMPRESSORS.—No. 721,221; B. V. Nordberg, Milwaukee, Wis.



In pump or compressor combination with cylindrical valve chamber communicating with pump cylinder through discharge port thereof and having outlet port, of oscillatory discharge valve having cylindrical hearings at ends fitted in chamber, and longitudinal working face spanning cylinder exhaust port when valve is closed, valve being cut away outside its working face between its end hearings to leave clear space between it and inner wall of valve chamber, and formed with one or more transverse passages leading from its working face opening on both sides of valve into space, an outwardly opening cup-shaped valve seated in each of passages, cap or plug closing outer end of each of passages, and spring interposed between each relief valve and associated cap or plug.

BAND FASTENER FOR TANKS.—No. 721,539; P. H. Bruinekool, Pella, Iowa.

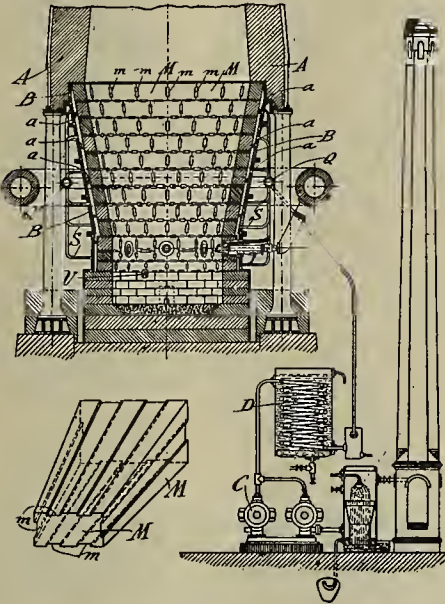


An improved hand fastener for tanks, comprising in combination two independent frames, each having substantially flat base, upright sides having openings

*See illustration on front page.

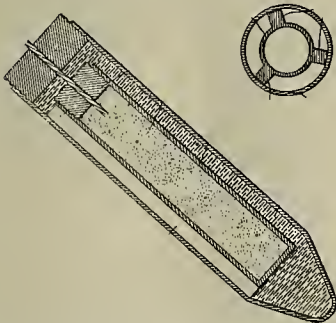
therein to receive journal, and integral cross piece connecting sides arranged slight distance above base and having opening through its central portion parallel with base, pivoted pawl having journals passed through openings in side pieces and having a central recess substantially in line with the opening in cross piece, and having eccentric, toothed, lower end, and bolt passed through cross pieces of two lugs, through recesses in pawls, and nuts on end of bolt resting against outer faces of cross pieces.

BLAST FURNACE.—No. 721,417; R. Berg, Pittsburgh, Pa.



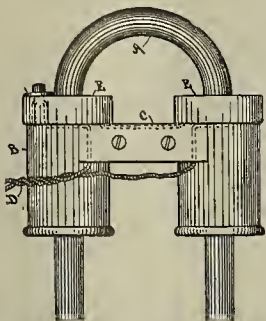
In blast furnace combination, with bush shell at lower part of furnace provided with openings, of horizontal ribs at interior of shell, firebrick lining supported between ribs and provided with channels, main pipe encircling lower part of furnace and connected with source of compressed and cooled air, and valved branch pipes connecting main pipes with openings in bosh shell so as to supply compressed and cooled air to same and to interior of furnace.

BLASTING CARTRIDGE.—No. 721,432; T. F. Durham, Philadelphia, Pa.



In safety blasting cartridge of character described, outer tube formed with one end closed, closed end being conical or tapering, other end being interiorly threaded, screw plug adapted to be inserted in threaded end, inner tube formed with one closed end, other end being interiorly threaded, screw plug threaded in threaded end, longitudinal ribs formed with interior tube, inner and outer tubes being molded from material composed of mixture of cement and silica, both screw plugs being provided with central openings from exterior of outer tube to interior of inner tube.

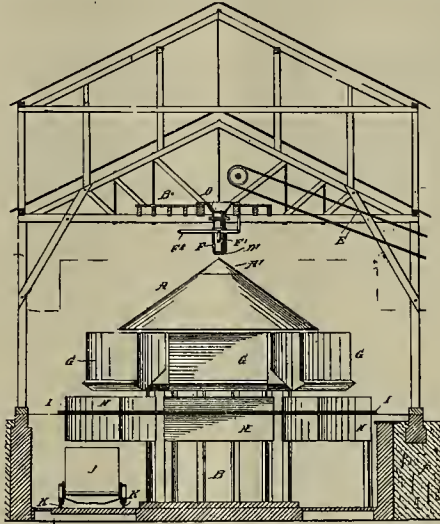
ELECTRO-MAGNET FOR SEPARATING METALS.—No. 721,490; G. H. Young, Elmira, N. Y.



An electro-magnetic separator for hand manipulation.

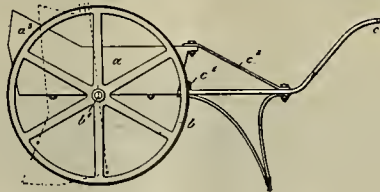
tion comprising steel or iron core of U shape having spool of wire wound upon each leg thereof, wire in spools running from one spool to other and ends being carried through suitable cable to source of current supply, bend of core piece forming handle, and button or other switch located in proximity to handle whereby current may be switched on or off by hand which grasps instrument.

APPARATUS FOR FORMING BLAST FURNACE CHARGES.—No. 721,505; A. S. Dwight, New York, N. Y.



An apparatus for forming blast furnace charges, comprising hopper, cone upon apex end of which hopper discharges, cartridge boxes into which base of cone discharges, and connected conveyers each receiving contents of one of boxes and delivering contents to common place discharge, and means for receiving and conveying charges one at time from common place of discharge.

APPARATUS FOR RECEIVING AND HANDLING MOLTEN MATERIALS.—No. 721,288; P. Danckwardt, Deadwood, S. D.



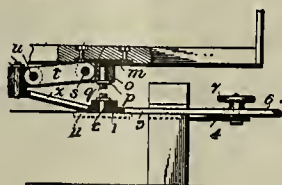
Apparatus for handling molten materials, composed of wheel-mounted pot having flat bottom and inclined straight front, false bottom, false front, and means for removably securing false bottom and false front to pot.

CRUSHING ROLL.—No. 721,208; W. C. Madge, Anaconda, Mont.



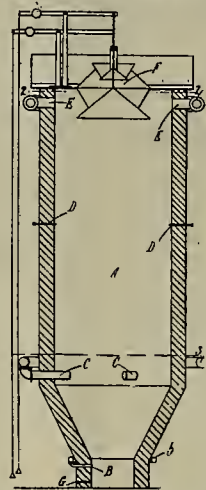
In crushing roll, combination of core provided with continuous peripheral groove and with circular series transverse mortises crossing groove counter-bored at both faces of core, series shoes engaging periphery of core and provided with mortised flanges engaging groove of core, tapering keys extending through mortises of core and shoes, and nuts upon smaller ends of keys.

ORE CONCENTRATOR.—No. 721,591; J. H. Michelsen and M. La Mothe Borglum, Butte, Mont.



In ore concentrator, combination of table, means for reciprocating table longitudinally, framework of machine, lever pivoted thereon, means for securing lever in different positions upon framework, and link or arm pivoted to table, link and lever being pivoted together in horizontal plane.

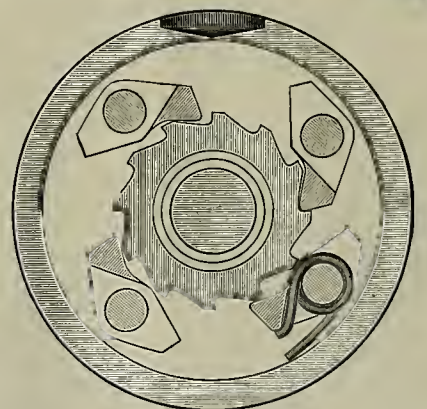
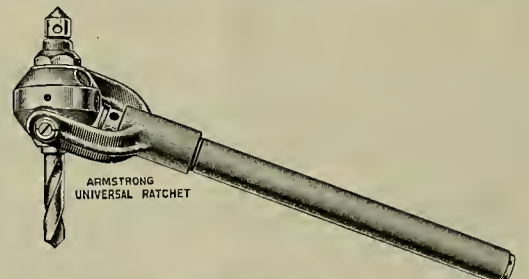
METHOD OF PURIFYING BLAST FURNACE GASES.—No. 721,617; G. J. Snelus, Frizington, England.



Method of treating blast furnace gas, consisting in passing gas through mixture of hot fuel, small bituminous coal and suitable flux, extracting dust from gas by forming with dust and flux fusible slag, enriching furnace gas by admixture therewith of gaseous products from bituminous coal, and converting carbon dioxide contained in furnace gas into carbon monoxide by combustion of carbonaceous fuel.

The Armstrong Universal Ratchet.

The Armstrong Bros. Tool Co. of Chicago, Ill., have recently placed on the market their Universal ratchet, a machine which they describe as having a great deal of merit and one capable of doing great service in tight places, being especially adapted to drilling holes in cramped places, which fact ought to make the ratchet serviceable in and about mines. It will drive a drill in any position where it is possible



Armstrong Universal Ratchet.

to move the handle either in vertical or horizontal direction or at any intermediate angle. The machine has no ball joints, bevel gears or other complicated parts, and for ordinary work the handle can be rigidly fixed almost instantly.

The movement is described as a new one. "Even a vertical motion of the handle will drive the drill. The bearings are cylindrical. The pawls do not slide lengthwise on the ratchet teeth. The universal quality of the tool is due only to the fact that the axis of the two trunnions on which the handle turns is at an acute angle with the axis of the drill. About 2 inches of motion of the end of the handle in any direction whatever will drive the drill. Fix the set screw up into one of the three countersinks, and you have a rigid handle, as in the common ratchet. In two of these fixed positions the handle stands at an angle out of the way of possible obstructions. In the No. 6 ratchet there are twelve large teeth in the ratchet and five pawls which engage one at a time. Thus the pawls catch sixty times in a revolution. For this reason the tool cuts about one-seventh faster than the common ratchet, even in ordinary positions, for it takes one stroke of the handle less to make the drill turn once around."

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

J. E. Cooling of Seattle, Wash., and S. Colclough of San Francisco, Cal., report the discovery of stream tin in their claims on Buck and Gold creeks, near Cape York, about 10 miles back from the coast. These creeks are stated to be 40 to 80 feet wide and 8 or 9 feet to bedrock. The prospect was discovered where the streams debouch from the gulches into an open, low, rolling country. No veins have been discovered as yet. The formation is slate.

W. B. Cotter, operating on Harris creek, near Nome, says Harris creek produced some gold the past season and the outlook in the Kougarak region is good. On Dahl creek, on claims owned by Yarnell, Olsen & Galvin, there are 2000 feet of ground stripped and in the face of the drift gold is showing.

Around Shovel creek, in the Solomon river region, near Nome, there are 100 men, with winter camps established. With the development of quartz, along with winter and summer placer diggings, the property holders consider the prospects of the camp encouraging. A good many men are at work taking out dumps for the spring cleanup. On Moran gulch, opposite No. 13 below, on Solomon river, W. Nelson is prospecting with a gasoline thawer. Ross & Chase have a lease on No. 7 below. They have a steam thawer at work. On No. 8, West creek, F. Alden is drifting on a quartz location. At the Lane quartz mine Superintendent Williams has men at work crosscutting and tunneling. The main shaft is down 115 feet. The mill is being installed.

The Nome Gold Digger says Nelson Bros., operating No. 10 on Hastings creek, run in two drifts and at a depth of 12 feet opened up three 2-inch strata of ruby sand, 15 inches apart, with gold in places plainly visible. The layers are removed one at a time, carrying the pay dirt in a canvas cloth to their cabin near the beach and the gold rocked out.

ARIZONA.

COCHISE COUNTY.

The Calumet & Cochise Dev. Co. has been organized by Lake Superior copper men to develop a group of fourteen claims in the Warren district, adjoining the Lake Superior & Pittsburg, Calumet & Pittsburg and Calumet & Bisbee.

The Calumet & Arizona Co. have bought a group of fourteen claims near Don Luis, out from Bisbee, for \$150,000.

GILA COUNTY.

G. Chittenden, manager of the Saddle Mountain M. Co., having an option on four claims in the Reed or lower basin of the San Carlos coal fields, near San Carlos, has begun development work.

M. Hotz, M. J. Murphy and H. J. Sisty, developing the Sultan group and other claims in Lost gulch, near Globe, have leased the Girard mill and expect to start it up next week on ore from the Badger mine.

The A. B. Copper Co., near Globe, under A. E. Wiley, superintendent, are working two shifts and sinking two double-compartment shafts. On the Bird they are down 145 feet and on the Tiptop of the Taylor group they have sunk 45 feet since Feb. 1. A steam hoist will be put up as soon as water is struck. In this district there are six shafts being sunk by five companies—a double-compartment at each the Mallory and Copper Hill, a three-compartment shaft at the Grey, a four-compartment at the O. D., and two double-compartment at the A. B.

GRAHAM COUNTY.

The Detroit Copper Co., near Morenci, are remodeling their plant. The new furnaces are of the copper matte variety. The concentrator will be changed from 500 to 800 tons capacity.

MARICOPA COUNTY.

C. H. Akers, president and manager of the Oro Grande Exploration & Dev. Co., has a bond on the Grand View group in the Blue Tank district, near Wickenburg.

MOHAVE COUNTY.

(Special Correspondence).—The Philadelphia-Arizona M. Co., E. T. Loy, general manager, at Chloride, operating the Minnesota-Connor, has the shaft down 600 feet. The milling ore goes to a bin of 250 tons capacity. The copper ore bin holds 150 tons.

The ore is dumped on a grizzly, the fine drops into the boot. The coarse goes through a Blake crusher on to another grizzly, the fine into a boot, the coarse to

a 11"x15" Dodge breaker, which crushes to 1/2 inch and less. Then the whole drops into a conveyor and is sent to rolls 14"x27", from which it drops into a bin. Thence it is fed to the second rolls, 14"x27", and elevated to a set of three screens which sizes for four jigs. The hydraulic sizers then feeds two Wilfley tables, the overflow going to a 40-foot V tank which sizes and feeds three tables. From the trommels it is fed to jigs. The middlings from the first jig return to the second roll, and middlings from the second and third jigs return to the third rolls. Middlings from the fourth jig and coarse Wilfleys run to a 5-foot Chilian mill. After feeding the middlings to the Chilian mill it goes into a settling tank 38 feet long. From the Chilian mill it feeds into a V tank which sizes for two tables, two Frue vanners handling the slimes. The concentrates from all parts of the mill feed into a hopper on the lower floor where they are drawn off and run to drying bins, whence they are sent to the railroad 1 1/2 miles from the mill.

Water is scarce in this locality and is kept in circulation. In concentrating they lose about 20% of the water. The tailings are discharged into a tank and drawn off into a car and the water drained off. The water is settled in tanks and pumped to a reservoir above the mill, holding 20,000 gallons.

The power used in mine and mill is furnished by an 180 H. P. Corliss engine, three 100 H. P. high-pressure Atlas boilers, a Cochran feeder and separator combined. Oil is used for fuel. All of the oil pipes are under a concrete floor. They have one 50 K. W. generator. The oil storage tank holds 25,000 gallons, with a 15,000-gallon tank at the railroad. The mill, hoist and entire plant can be run with nine barrels of oil per twenty-four hours. In the blacksmith shop the machinery is operated by power. Capacity of the mill is 150 to 200 tons per day. The ore is sulphide bearing gold, silver and copper, 40% of the value being gold. The property consists of sixteen claims. In places the vein is 20 feet wide of milling ore. There is a large amount of ore blocked out, but the company will be obliged to develop more water. Water for domestic and boiler use is obtained 1/2 mile from the mill, the remainder of the water coming from the mine.

Chloride, Feb. 26.

PINAL COUNTY.

At Troy a strike in the Alice mine is reported. In a crosscut, at a depth of 200 feet, 2 feet of black sulphurets assaying \$26 in gold were cut, and at a depth of 400 feet the ore body widened to 4 feet, giving \$20 and 12% copper.

SANTA CRUZ COUNTY.

(Special Correspondence).—The Nogales C. Co. of this place will build a large stamp mill and cyanide plant on the property they recently bought.

L. F. Swain, manager St. Bibiana M. Co. of this place, is about to make extensive purchases of that class of machinery. Nogales, March 1.

(Special Correspondence).—The Nogales C. Co. of Nogales have seventeen claims 12 miles northeast of Nogales. They have 3000 feet of development. They intend erecting a mill. Ore averages 6% copper and two to four ounces in silver. The same company are working a lead property 18 miles west of Nogales. Have a dump of 30,000 tons of 20% lead ore. In the lower workings they have struck ore reported to run 45% to 60% lead and six to ten ounces in silver. There is a hoisting plant on the property.

Nogales, March 2.

(Special Correspondence).—The Pride of the West mine, mill and smelter at Washington are closed down and no definite information can be obtained when they will start up.

Washington, Feb. 28.

YAVAPAI COUNTY.

G. W. Middleton of Prescott is going to put in a smelter.

The Great Belcher-Bullwhacker G. Co. is the name of a merger organized to include the Great Belcher mine and the Bullwhacker mine, near Prescott.

Manager D. C. Monroe of the Monroe Con. M. Co. at Walker says they will install reduction works of 200 tons capacity per day.

N. C. Bonnevile of Denver, Colo., consulting engineer, says they are planning the erection of a 100 ton mill at the Crown Point mine, near Prescott.

L. Pfau, president of the Pfau G. M. & R. Co., says they will start operations on the Verde slope of the Cherry Creek district, 12 miles south of Jerome. Their holdings include the Red Hill group, Valley Anthony, St. Claire and millsite of six acres.

The tailings dump of 30,000 tons at the Crown King mine, near Prescott, is reported sold to New York men for \$75,000,

and that the same parties were given an option on the mine.

YUMA COUNTY.

The Success Copper Co., at Quartzsite, C. E. Eichelberger of Los Angeles, Cal., president, propose to erect a smelter at Yuma, where the ore can be treated at low cost. Additional development machinery is being installed at the mine.

CALIFORNIA.

AMADOR COUNTY.

At the South Eureka mine, near Jackson, crosscuts have been run 300 feet east and west, and to the east ore has been found. The main shaft, down 2300 feet, will be continued 100 feet deeper and other crosscuts run.

The repairs to the shaft and machinery at the Zella mine, at Jackson, have been completed and operations resumed this week.

At the Central Eureka mine, near Sutter Creek, the management is taking advantage of the temporary hang-up of the mill—due to failure of electric power with which it was operated—by starting sinking and will put the shaft down 100 feet deeper.

BUTTE COUNTY.

W. P. Lynch has bought the Spring Valley hydraulic mine at Cherokee, including the Concow reservoir and water right, which is considered sufficient to run the mine by drifting. Operations will resume this week.

CALAVERAS COUNTY.

The machinery for the Carson Hill G. M. Co., near Irvine, is on the ground. The tunnel is in 110 feet, says Manager S. P. Smith.

The Morris tunnel, being driven through Bald mountain, near Sonora, from the Woods creek side, is in 1100 feet.

Work has begun on Nigger hill, near Jamestown, on the group recently bought by J. P. E. Heintz. M. P. Pinney is superintendent and a double-compartment shaft will be sunk.

At the Grizzly mine, near Carters, Superintendent W. R. Hall says drifts north and south have struck ribbon rock. The vein is 5 feet wide and shows free gold. The Grizzly shaft is down 300 feet below the 1700-foot bottom of the Dead Horse.

The Sherman mine, in Salt Spring Valley, near Hodson, is being worked by Superintendent Rathburn, and a 3 stamp mill is crushing ore from one of the veins.

The Easy Bird quartz mine, on the Mokelumne river, north of Mokelumne Hill, is working twenty men. The Peek ditch, taking water from the Mokelumne canal, is being cleaned out, and as soon as this is completed grading for a 10-stamp mill will begin.

T. Rooney of San Francisco has begun work on the Bernardi blue gravel mine, at Chili gulch, near Mokelumne Hill, with ten men, under the superintendency of F. Bernardi.

The Calaveras Chronicle says Superintendent W. T. Robinson has twelve men at work on the Red Hill gravel mine, at Buckeye, near Mokelumne Hill, and 4000 feet of hydraulic pipe is being laid. A tunnel is being run under the ditch to tap the channel from the head of Alexander gulch.

The Nineteenth Century quartz mine and the Pocket placer mine, on French Hill, near Mokelumne Hill, was hounded last week to the Nebraska-California M. Co. for two years for \$2000. The first work will be clearing out the water ditch and putting up a pumping plant.

KERN COUNTY.

The 10-stamp mill building at the Echo mine, 5 miles from Mojave, will be completed by March 10. Development of the mine is in progress.

At Sunset the Gilt Edge has a well down 1600 feet and in oil sand.

At McKittrick, the McKittrick Oil Co. reports having brought in a well last week that flows 300 barrels a day and is 740 feet deep.

The Arcata, between the Stratton property and the Altoona-Midway wells at Midway, at a depth of 1164 feet went into oil, and the sand rose nearly to the top of the casing.

MARIPOSA COUNTY.

McCarthy & Soderburg are developing their mine, near Kinsley, and intend putting in six more stamps, making it a 10-stamp mill, with water power from the Merced river.

The Austin Group M. & M. Co. is putting a steam hoist on the Coronado mine, near Whitlock. They also intend to put one on the Golden Gate, while the tunnel from the creek level on the Whitlock Chief mine will be driven ahead.

Weston, Patterson & Kinsley are working the Dugan mine, near Kinsley, under

hond, and last week made a mill run which returned \$20 per ton. The vein is 6 inches wide.

MONO COUNTY.

A new mining field is being developed between Oasis and Silver Peak, 12 miles from Oasis, says the Inyo Register. At present twenty men are at work, all on their own locations, besides the Hector M. Co., of which Hill & Barlow of Bakersfield are principal owners.

NEVADA COUNTY.

(Special Correspondence).—In Meadow Lake district five mining claims have been hounded to Los Angeles parties—Cash on the Dump, Sedgwick, Alice, Hattie and Angus. The property adjoins the Excelsior mine, now operated by the Crystal Lake M. Co. The Cash on the Dump G. M. Co. has been organized in Los Angeles; J. B. Ladd, president; J. M. Brown, secretary and treasurer; M. E. C. Munday, vice-president; R. Baker and J. D. Hoff, officers and directors.

The Crystal Lake G. M. Co. are running their ten stamps during the day only on ore from the Excelsior mine. The mine is not opened sufficiently to keep mill running the twenty-four hours. The output for the past five months has been between \$3000 and \$3300 per month. Recently a body of high-grade ore has been opened in the main tunnel. The manager, T. H. Murray, intends to develop the mine so that the mill may be run full time, and the addition of ten stamps more is being considered.

Emigrant Gap, Feb. 28.

The Murchie Con. G. M. Co. has been incorporated; C. F. Humphrey, B. Goodman, J. J. Meyers, A. Maltman, W. T. Farrar, J. C. Campbell. The Murchie mine is in Willow valley, near Nevada City. The company also owns the Lone Star and Alice Bell mines, adjoining the Murchie, and an 8-stamp mill, which is being overhauled. J. C. Cambell is manager.

The 20-stamp mill at the Red Cross mine, near Washington, is in operation.

The Alta mine, near Washington, has resumed after a temporary suspension on account of the heavy storms last month.

The Standard mine, near the Jenny Lind, near Grass Valley, will be reopened, says C. A. Emery, a Boston member of the company. The shaft is down 150 feet, where it is tapped by a drain tunnel 500 feet in length. It is the intention to continue sinking, following the vein. The company owns five full claims and a 20-stamp mill will be installed.

PLACER COUNTY.

The 5-stamp mill at the Crandall mine, near Auburn, is in operation. F. Hartley is superintendent.

At the Gaylord mine, near Auburn, the black sand which has heretofore been allowed to run to waste after being partially worked, has been found to run well in fine gold; it will hereafter be shipped to the Selby works for reduction.

SACRAMENTO COUNTY.

The Sutter M. Co. has put in an oil burner on their Keystone drill on the Murray ranch.

SAN BERNARDINO COUNTY.

The American Niter Co., G. E. Bailey, consulting engineer, and E. P. Ripley, part owner, controlling niter deposits near Daggett, will install this spring an experimental plant for developing their holdings in Death Valley. They have recently had surveying parties out, and it is said the company will soon have 300 men at work. There are other minerals found near the niter beds—horax, bicarbonate of soda and gypsum.

SANTA CLARA COUNTY.

Last week, after passing through 200 feet of clay, the Watsonville Oil Co., operating on the Sargents ranch, 7 miles south of Gilroy, struck the oil sand at a depth of 675 feet, the force of the oil and gas carrying the tools 40 feet in the air. The well is near the old tar spring, in which district the same company have struck several wells, this one being the eleventh and the second well yielding oil in paying quantities.

SHASTA COUNTY.

The Connor G. M. & M. Co. report a strike on the Connor group on Clear creek near the Mount Shasta mine, near Shasta. In the 120-foot tunnel they cut the ledge found on the surface, 100 feet above, and have opened 2 feet of sulphide ore showing free gold.

The Mount Shasta Gold Mines Corporation, F. E. Ware manager, has let contracts for further development of the Summit group on Backbone creek, near Kennett. The Mount Shasta mine, one of the group, has been equipped with electric power for the mill. Steam is still used for air compressor and hoist, but the company expects to put in a larger compressor this spring, when electricity will

be applied and compressed air used in running the hoist.

The gold mines of Old Diggings district, near Redding, have several shipments of quartz ready for hauling to the smelter at Keswick. Superintendent Woodrow of the Texas mine has 100 tons of quartz loaded on flat cars at Central Spur. The lessees of the Mammoth have sixty tons loaded and awaiting orders. C. Hoskins, lessee of the upper workings of the Texas mine, has two cars of assorted ore loaded. Other lessees at the Spanish and Central mines are preparing ore for shipment.

The Washington mine at French Gulch has twelve men at work and is taking out 200 tons of ore per month.

The Higbland quartz and placer mine, at French Gulch, has resumed under the superintendence of M. H. Peck.

SISKIYOU COUNTY.

(Special Correspondence).—The Ball mine has been sold to El Paso, Texas, men; \$10,000 has been paid; price, \$300,000.

Sawyer's Bar, March 2.

Boston men have bought the Commodore mine, Barkhouse creek, near Etna, says the Advance. Operators will begin this month and additions made to the plant. They expect to sink a shaft from the lower tunnel.

The Etna Advance says the Ball mine closed down temporarily last week, owing to the freezing spell. The aerial tramway is in operation. The company will add ten or twenty more stamps to their mill this spring.

TUOLUMNE COUNTY.

W. A. Holmes has begun work on the John Royal mine in Experimental gulch, above Columbia. He has put in a 100 H. P. hoist and intends sinking several hundred feet.

Fire partially destroyed the top works at the Del Monte mine, near Groveland, last week.

The mill test of ore from the crosscut at the 150-foot level of the Nonpareil mine, near Groveland, made last week, gave returns of \$5 per ton, free milling, says Superintendent Dron. The crosscut is 53 feet in length and the hanging wall has not yet been reached.

C. Richards is preparing to open up the Wheel Rough mine, near Soulsbyville.

At the Belle mine, near Tuttletown, the shaft is down 500 feet, the vein at that point showing free gold. A main three-compartment shaft will be sunk south of the present one.

At the Street mine, near Tuttletown, drifting is in progress on the 300-foot level north of the shaft, says Superintendent Kingman.

R. Hersey of San Jose, as trustee, has bought forty acres of placer ground near the Mayflower tunnel, 1 mile south of the Tuolumne river, near Groveland, says the Independent. Hersey, for \$4500, has also bought the Bright Star and New Discovery group of mines, near the Duleek mine.

The Independent reports the Springfield Tunneling Co.'s placer (Woodside gravel mine), on Table mountain, near Sonora, has been rebanded by the present operators to Philadelphia men for \$45,000.

The Horseshoe Bend G. M. Co. of Boston, Mass., last week bought for \$10,000 the Doyle mines, which divided the company's several claims on the Stanislaus river, near Columbia. The company now owns twenty claims and development work will begin this month.

Work on the Carlotta group of mines, near Carters, has begun under the superintendency of C. L. Lang, says the Democrat.

The Santa Ysaabel G. M. Co. has turned over all its property and assets to the Santa Ysaabel M. & M. Co., incorporated under the laws of Arizona. Certificates of the latter are being delivered upon the payment of the balance due of 10 cents per share. The new company starts with twice the area and with \$150,000 to \$175,000 cash on hand. The mine, near Stent, is being unwatered and machinery put in order.

COLORADO.

BOULDER COUNTY.

H. P. Walker, superintendent of the Ingram mine at Salina, says the mine has thirty men at work on leases.

CLEAR CREEK COUNTY.

The McClelland tunnel of the Monarch M., T. & P. Co. has opened a flow of water in the mine at Freeland, 2 miles west of Idaho Springs. This has increased until there is a stream averaging 3000 gallons a minute.

The Joe Reynolds mine, on the opposite side of the creek facing the East Red Elephant tunnel, near Lawson, has been drained by the tunnel run in on the Elida vein. This tapped the bottom of the Joe Reynolds shaft and has opened up the ore body showing workable values.

The Silver Standard says arrangements

have been completed and the contracts let for completing the Atlantic-Pacific tunnel near Silver Plume, which is in 6000 feet and will pass under Gray's peak. N. West is superintendent, and operations will begin as soon as supplies and machinery can be sent up to the tunnel.

CUSTER COUNTY.

The Gold Metal M. & M. Co. has been reorganized, with the addition of other mining territory, as the New Gold Metal M. & M. Co., by J. Schell of Querida and P. M. Finnis of Custer. The consolidation includes the Pochontas-Humboldt mines at Rosita, seven claims at Telluride, San Miguel county, and 16,870 acres of placer and lode ground in New Mexico. The first work of importance will be on the Pochontas-Humboldt or Rosita property, where the erection of a 50-stamp mill is proposed.

FREMONT COUNTY.

Announcement is made that the Portland Cement Co. will build a factory on the north side of the Arkansas river near Florence for the manufacturing of plaster of Paris from a bed of gypsum they have located there.

The Fremont coal mine, near Rockdale, under operation by the Colorado F. & I. Co., has been equipped with an electric lighting plant. The main workings underground, as well as on top, are lighted. The coal is mined by electric drills.

The seepage from the clear water wells drilled by the Colorado Springs & Florence Oil & Gas Co., near Chandler, is said to be flooding the lower side of the Chandler mine, and a portion of that end of the mine is being abandoned. Electric pumps are being used to reduce the water. The three wells are a mile from the mine and the flow is 360,000 gallons per day. The water will be piped along the Arkansas river and used in Pueblo for domestic purposes. The company will drill other wells. They were drilling for oil when they tapped this underground reservoir.

The Union mill, near Florence, is in operation, with 200 men at work and handling 450 tons per day. Five furnaces are in operation.

Enlargements in the roaster, concentrator and precipitating departments of the Dorcas mill near Florence are being made. The plant is treating 100 tons a day.

GILPIN COUNTY.

Last week the 50-ton concentrator and stamp mill in Chase gulch, near Central City, was started up. The plant was built by the Lyons-Kyle G. M. & M. Co., W. Wood superintendent, to handle the ores of the Tucker mine. The plant is driven by steam power; they have an ample water supply and have built several storage reservoirs for winter use. The buildings are lighted by electricity.

The Gunnell M. Co., near Central City, has resumed and are unwatering the mine. Below the Gunnell and on the same hill, the Buckley mine has resumed and is making regular shipments of ore.

The Fostoria G. M. Co., B. M. Myers superintendent, operating the Hall ranch group near Central City, will enlarge their plant and put in heavier machinery.

Jones, Hardy & Miller of Russell Gulch have taken a lease on the Defiance mine, near Russell Gulch, and have begun work in the lower levels to get under the chute of ore which was found on the 100-foot level.

The Avon mill, in Nevada gulch, near Nevada, is in operation with twenty stamps dropping on ore from the San Juan mine, on Quartz hill, which is delivered by tramway.

GUNNISON COUNTY.

A coal camp is building up at Somerset, in the northwestern part of the county. A vein of first-class coal is being worked by the Wasatch Coal Co. of Utah with 150 men employed. The company is installing a set of four scales to cost \$10,000. The location is 2 miles from the Delta county line and near the Dorrance, Gelwich and Juanita banks.

The Rosalasa M. Co. has leased the Granite Mountain group in Jones' gulch, near Pitkin, for two years, and work was started up last week.

LAKE COUNTY.

Near the Valley mine, near Leadville, the Blue Ribbon mine is being worked by local lessees headed by T. V. Gallagher. They are sinking a new shaft with three shifts and expect to tap the Valley ore chute at about 160 feet.

The American S. & R. Co. have their sulphide mill at the A. V. plant at Leadville in operation, beginning with a capacity of 300 tons a day.

Surface improvements are under way at the Coronado mine, near Leadville. The boilers are being overhauled and pumping will be resumed next week. The retimbering of the shaft is completed, says Superintendent D. Jones.

Manager McGreevy of the Catalpa-

Crescent, near Leadville, is taking out three products from the discovery shaft—a good grade of lead, an oxidized iron and manganese which goes to the steel works at Pueblo—a total of thirty tons a day.

Superintendent Johnston of the Big Six mine, near Leadville, reports having finished sinking an additional 107 feet on the Little Prince shaft, and, after going through 60 feet of quartzite, cut an intrusive sheet of porphyry. At this point he proposes to run drifts and prospect east and west.

Superintendent G. Campion of the Little Bob mine at Leadville says the contact ore body cut last week has been opened up, showing 60 feet thick. It assays \$5 in gold and one and one-half ounces in silver and a cyanide plant will be installed. The ore lies between porphyry and quartzite walls and is a body of decomposed quartz.

Manager F. Brooks reports opening up the extension of the Resurrection ore chutes in the Diamond mine, near Leadville, at 200 feet in on the drift from the 1020 foot point in the shaft. A larger hoist and other machinery will be put in and shipments started.

There are 200 men at work in the Moyer mine, near Leadville, says Manager J. Walsh, and the present working shaft is being taxed to its full capacity. The North Moyer shaft will be down to the level driven out of the ore stop by the 10th inst., and a heavier hoist will be installed there, after which it is expected to increase the output of the mine by one-half the present tonnage.

A. J. Andrews of Montreal, Canada, part owner in the Dolly B mine near Leadville, has closed down the property, owing to a disagreement among the owners as to their operating policy, says the News-Dispatch.

MINERAL COUNTY.

Manager Fitzgerald of the Humphrey mill, near Creede, says the new assay office on the floor of the first set of rolls is completed. Everything is automatic, samples are conveyed from automatic sampler to crushers and rolls from which pulp moves through troughs to screens, the oversize carried back for regrinding, while screenings are delivered on bucking-board.

The Big Kanawha (United Mines Co.), near Creede, instead of depending on the water power in future will put in a steam plant to be used in the fall and winter months when water is short. As soon as the snow melts in sufficient quantity the Humphrey mill will resume and run at rate of 350 tons of ore per day, says Manager Fitzgerald.

The Captive Inca mine, between the Antlers-Park Regent group and the continental divide, near Creede, is being developed as a gold producer, with W. G. Boyle, manager. J. R. Hanna of Monmouth, Ill., is president of the company. A contract has been let to sink a shaft 5 by 15 feet to a depth of 500 feet. The company expects to sink this shaft to 800 feet, from which point they will drift to the Bachelor mountain vein.

OURAY COUNTY.

The Treasure tunnel at Red mountain has closed down indefinitely after being driven 4900 feet on its course toward Telluride. The shut down is owing to litigation over the right of the tunnel to pass through a prior location on its line, says the Standard.

PARK COUNTY.

It is reported the Snowstorm Hydraulic Co. is to absorb the Alma placers, which include most of the Platte River valley from a point 1 mile below Alma up to Montgomery, 6 miles above, including the priority water rights. The Snowstorm Hydraulic Co., organized by Colorado and Eastern men, own the placer lands from a point half way between Alma and Fairplay, extending to below the latter town, known as the Snowstorm and Beaver Park placers. Manager Evans of the Goldpan Co., at Breckenridge, is part owner.

SAN JUAN COUNTY.

The Mammoth T. & M. Co.'s holdings in Prospect basin, near Silverton, consisting of twenty-eight claims, tunnel site, millsite, water right, etc., has been bonded and leased to the Stony Pass M. Co., A. A. Brown, manager, for fifteen years. The tunnel will be extended 500 feet additional, and the Hercules, one of the group, will be equipped with a steam hoist.

The Stony Pass M. Co. has incorporated to operate the C. A. Marshall group in the Stony Pass section, near Silverton. A. W. Hall, F. Jones, W. A. Brown, W. F. Pope of Maine, J. F. Shafer. A. A. Brown of Silverton is manager and superintendent.

SUMMIT COUNTY.

The Mountain Pride Co. shut down last week for repairs in the mill, after a continuous run of fourteen months. The

snow made it impossible to keep a wood supply on hand.

The Robinson pyritic smelter, at Robinson, will be blown in April 1, says Superintendent Doolittle.

TELLER COUNTY.

The Cripple Creek Times says the value of tonnage of ore produced from the mines of Cripple Creek district for February amounted to \$1,651,970, from 51,674 tons of rock crushed:

	Tons.	Average Value.	Value.
Smelter....	9,000	\$55 00	\$495,000
Economic....	5,000	27 50	137,500
Dorcas.....	3,200	37 50	120,000
Aurea.....	1,774	5 00	8,870
U. S. R. & R. Co.....	25,000	27 00	675,000
Portland....	7,700	28 00	215,600
Total..	51,674		\$1,651,970

This production is less than for some months past, the shortage being partly due to severe weather and a temporary breakdown of the La Bella power plant, which supplies several of the mines with air. The Colorado plant of the United States R. & R. Co. was closed fifteen days of the month. Repairs are being made to that plant. Figures from the Telluride mill were not obtainable.

The Jack Martin Leasing Co., leasing the Guyot hill property of the Robert Burns Co., near Cripple Creek, are operating through the tunnel level, where a winze has been sunk to 200 feet, giving 400 feet depth below the surface. Drilling is in progress from the bottom of the winze in a southeasterly direction to explore the country. Ore has been cut assaying \$10.

The Times reports a new ore shoot to Gold hill opened in the second level of the main workings of the Lexington Co., adjoining the Anchoria-Leland, at Cripple Creek. Lawry & Miterer are operating the property under a bond and lease. The vein lies northwest of the shaft and is 3 feet wide, assaying \$18 in gold. The ore shoot has been proven in length for 35 feet.

The Gold Cord M. & S. Co. has a lease on blocks 13 and 14 of the Bonanza King, on Gold hill, Cripple Creek, and a steam hoist will be installed.

The Doorkey G. M. Co. last week received a patent on the Malta claim of 49 acres on Galena hill, near Cripple Creek. The company also owns the McCumber-Morning Star and Doorkey claims on Tenderfoot hill. A. F. Woodward is president.

The cyanide plant of Nesbitt & Miller at Cripple Creek is in operation and handling rock from the Pharmacist dump at the rate of thirty tons a day.

The territory owned by and under lease to the Moose Co., on Raven hill, Cripple Creek, is being prospected by diamond drilling.

Lateral work has been started by the Cripple Creek Enterprise G. M. Co., at Cripple Creek, at a depth of 200 feet.

The Cripple Creek & Pueblo Railroad is driving a 4 mile tunnel, double-track width, from Cripple Creek to Victor. The engines will haul fifty cars at a time. The plan is not to mine, but to transport ore from underground workings to mills and smelters, saving the cost of hoisting. The freight rate will be 50 cents a ton for dirt and \$1 a ton for ore. The main tunnel will be straight and level, but branches will be run on irregular grades to reach important mines. Work was begun Jan. 1 and they are making the record of 30 feet per day. The Mary McKinney, Doctor-Jack Pot and Anaconda mines have already been reached at from 600 feet to 1000 feet depth. The greatest depth, 1550 feet, will be reached this month.

The Cripple Creek Times reports an option has been given on the controlling interest of the Golden Cycle mine, on Bull hill, Cripple Creek, to W. H. Reynolds of New York.

The El Paso Co. have three shifts at work in their third level, at depth of 490 feet, drifting on the C. K. & N. toward the latter property, and expect by March 10 to tap the water and drain the C. K. & N. shaft. The El Paso Co. is breaking the ore 34 feet wide, all of it being shipped smelting grade.—Development is being done in the east vein of the Little May, with stoping in progress in the first level, breaking two-ounce gold ore. The company is shipping two carloads a day of smelting ore. At present there are six sets of lessees operating on the company's holdings, with five of them on the shipping list.

The Hawkeye claim, at the head of Barnard creek, near Cripple Creek, will be operated by the Hawkeye G. M. & M. Co., incorporated last week; W. A. Parkinson, F. A. Wright, W. E. Lloyd.

A plant of machinery will be placed over the shaft of the Blue Flag on Raven hill, Cripple Creek, owned by a Denver company. An old shaft has been retimbered and the collar raised.

IDAHO.

CUSTER COUNTY.

The Shakespeare lode, on Loon creek, running parallel with that of the Lost Packer, says E. Macheth of Custer, shows 3 feet of ore at the surface running \$30 gold per ton.

ELMORE COUNTY.

The General Pettit mine, near Atlanta, has been sold to New York men for \$130,000. A cyanide plant will be installed this spring.

IDAHO COUNTY.

F. Brown, manager of the Jumbo mine at Buffalo, reports that his company will build a 20-stamp addition to their mill. He says: "We have between \$12,000 and \$15,000 worth of the second-grade ore awaiting the erection of a cyanide plant. The tailings will be treated by the same process. There are 1 1/2 year's run of tailings from the 4-stamp mill stacked up, which assays \$5 per ton. Work is progressing on the lower ore shoot. It has been crosscut every 50 feet, and in each drift its width is 11 feet. The Jumbo, with four stamps, is producing \$5000 each month. The total output of the district from the four mines, operating twenty-nine stamps, is about \$20,000 per month."

H. L. Hollister, acting for Chicago men, has bought the Homestake & Idaho group of seventeen claims for \$125,000. The mines are on Beaver creek, in the Thunder Mountain district, near Thunder.

KOOTENAI COUNTY.

F. G. Jordan, of Spokane, Wash., manager of the Pacific Portland Cement Co., operating in the Pend d'Oreille district, near Sandpoint, says the Pacific Portland Cement Co. has its works on the Pend d'Oreille river, 52 miles southeast of Northport, Wash., and when the plant is complete will turn out 100 barrels of cement daily. The company has 400 acres of land producing cement materials, above the works, and 1250 feet above steamboat level. The machinery for the works will be run by water power. The cement is taken down the river by steamboat to Northport, then shipped to Spokane.

In the lower workings on the War Eagle claim, owned by the Tyson Con. M. Co. at Tyson, and adjoining the Richmond on the east, the ledge was crosscut last week. It shows 12 feet wide and carries free gold.

The Panhandle S. & R. Co. of Minnesota men plan the erection of a smelting plant at Sand Point, and it is intended to have the works in operation by September. The work of excavation has begun. One furnace of 300 tons daily capacity will be installed at first and gold, silver and copper ores reduced. A waterfall 300 feet high, 1 1/2 mile from the smelter site, will furnish 1000 H. P., says Superintendent H. M. Williams. The Queen Aoo mine, owned by the Panhandle Co., contains deposits of iron ore averaging 18%. Mixed with this ore is lime rock, making it a flux for the silver and lead ores of the district. The Queen Ann is on Trestle creek, within easy access of the smelter. The company have bought a number of boats and from the mines of the northern districts ores can be shipped across Lake Pend d'Oreille at a cost of 50 cents per ton.

OWYHEE COUNTY.

At De Lamar, says the Nugget, the De Lamar Co. is taking out 180 tons of ore per day, which is handled by their concentrating mill.

Electric drills have been installed at the Alta-Vista mine, near Silver City.

Manager A. G. Stephens says a strike was made in the group of the Traders' M. Co. on a drift driven from the main workings of the mine, opening a 5-foot vein of free milling gold ore which assays \$30 per ton.

SHOSHONE COUNTY.

L. W. Stedman, manager of the Paragon mine at Murray, says the shaft is down 80 feet. The machinery for the hoist and pumps has been installed. They will sink 300 feet and then run a crosscut for 145 feet, at which point it is expected the lead will be cut.

The Sterling M. Co., owning a group of seven claims on Lake gulch, south of Osburn, filed articles of incorporation last week; A. Murphy, J. Presley, W. W. Woods, M. Presley of Wallace and W. H. Myers of Mullan.

The sampling works below Wallace report that the tonnage sampled during January amounted to 13,485 tons, which exceeds that of previous months by 3000 tons. Further additions will be constructed and then the plant will be able to treat 15,000 tons per month.

A strike is reported made on the Sparrenberg group on Big creek, near Mullan. The ledge was cut by the tunnel at 300 feet and shows 3 feet of ore carrying 10%

copper, 12 ounces silver and \$5 in gold.

The Springfield mine, on Stevens peak, has resumed. There are a number of other properties that will start up this month, among which is the Flinn group, adjoining the Morning mine.

Another shoot of concentrating ore, thought to be running out from the main ledge, was cut on the Humming Bird silver-lead group, near Burke, last week. The property is north of the Tiger-Poor-man, the mouth of the tunnel being on the ground of the latter. The vein has been exposed in the upper workings. The tunnel is in 1500 feet.

The Stevens Peak M. Co., near Mullan, resumed operations this week, having been idle since the snowslide of a few weeks ago, which covered the tunnel and wrecked the buildings. Drifting will be started on the ledge, which was cut in January, says Manager Baillie.

The Snowstorm's 2-drill compressor plant, near Mullan, was put in operation last week, being run by water power. The management expects to put in a larger pipe line to the flume.

MICHIGAN.

HOUGHTON COUNTY.

The sale of land, near the Atlantic mine, south of Houghton, to be voted on at the annual meeting of the Atlantic M. Co., is the proposed site of the smelter for the South Range mines. It is said the Copper Range Co. interests furnish the capital and the Atlantic the land.

INGHAM COUNTY.

In his annual report to the directors, Superintendent Harris of the Quincy, near Mason, says the underground electric haulage, north of No. 6 shaft, has given satisfactory service during the past year and has been the means of transporting rock to shaft at a considerably lower cost per ton than formerly; 50% of the stamp rock mined, tributary to this shaft, is handled this way. At present there are in operation four electric locomotives and thirty-six steel cars of two and three-quarters tons capacity each, and ten additional electric locomotives will be installed this spring.

MONTANA.

BEAVERHEAD COUNTY.

P. I. Smith, manager of the Crystal Graphite Co., says C. Frohman of Chicago, Ill. has leased their entire group of graphite mines in Axe canyon, near Dillon, for twenty years. The mines will be developed extensively, and Smith remains as manager.

FERGUS COUNTY.

The Spring Creek Coal Co. has been incorporated by J. A. Borgh, J. L. Bright and A. Green, of Lewiston.

The Hegener mine, on Carpenter creek, near Lewiston, has been shut down, the development work not showing ore bodies of sufficient value to warrant the operators to continue, says the Argus.

The Abbey Cyanide G. M. & M. Co., operating north of the Barnes-King group, near Keodall, have begun work on an incline shaft to develop their ore bodies, says Superintendent E. Johnson. A gasoline hoist will be installed. Drifts and crosscuts will be run when the shaft reaches the 75-foot point.

GRANITE COUNTY.

J. Graot, operating the Blue Bird group at the head of McDermott gulch, near Phillipsburg, says he is opening up a body of ore, which can be handled by cyaniding. Machinery will be installed this spring.

LEWIS AND CLARKE COUNTY.

Longmaid Bros. of Helena have bought the Gloster mine, near Marysville. The lead has been developed to a depth of 800 feet. It is the intention to operate the old mill and put in cyanide tanks to handle the tailings.

MADISON COUNTY.

W. B. Millard of Nebraska has bought a one-sixth interest in the Kearsarge mine, near Virginia City, for \$2500.

J. W. Wright, developing the Silver Group claims in Carmichael district, 6 miles from Pony, reports a strike of 18 inches of ore in the bottom of the shaft down 65 feet, which assays 400 ounces in silver.

A strike has been made in the Whippoorwill mine, near Virginia City, in Sand Creek district. While drifting the lessees cut a 12-inch body of gold ore, which assays \$300.

L. D. McCall of Chicago, president of the Bismarck Nugget Gulch M. Co., near Virginia City, says the work done so far has been largely experimental, but now developments are to be increased. They own the Levi Carter mill and smelter on Mill creek. The mill capacity will be increased to 100 tons daily, and a bucket tramway,

to transport the ore from the mine to the mill, a distance of 1 mile, will be put up. In the spring it is intended to install an electric plant farther up the creek capable of producing 500 H. P. There are fifty men on the payroll.

MISSOULA COUNTY.

The Dennemora G. & C. M. Co. has been incorporated to develop a group of claims near St. Regis.

A strike, in which 2 feet of galena were opened, is reported made on the Tarbox silver-lead mine, 3 miles from Saltese. The strike was made on the drift being run from the bottom of the 225-foot shaft. The company has decided to sink the shaft to the next level.

POWELL COUNTY.

A dredge will be installed this season for placer mining on Georgetown flats, near Deer Lodge.

RAVALLI COUNTY.

The Wood Placer M. Co. at Hughes creek, near Hamilton, has twenty-two men at work digging the blighline ditch to furnish pressure for the lower camp, the bedrock drain for ground below Keating's claim and putting up the new camp on the lower ground.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence)—The cyanide plant which has been treating the tailings from the Monte Diablo mill at Sodaville, Nevada, the past six months has closed down for the winter. A. Weihe, of San Francisco, is the owner of the plant, which is fifty tons capacity. Tailings are low grade, containing gold, silver and quicksilver, with some copper and traces of antimony, and in character are almost identical with large dumps of tailings at Belleville from the Holmes and other Candelaria mines.

Sodaville, March 1.

EUREKA COUNTY.

Treasurer B. L. Smith of the Rocco Homestake Co.'s mines, near Eureka, reports that during the year they produced ore that netted \$46,925, and while the earnings have not equaled those of the two years preceding, the shrinkage has been offset by the results of exploratory work. An ore shoot opened up affords an average of 40% lead and 21 1/4 ounces silver.

HUMBOLDT COUNTY.

The Lovelock Commercial Co. will ship 100 tons of gypsum per week to San Francisco, Cal.

LINCOLN COUNTY.

In the Yellow Pine mining district, near Sandy, the Nevada-Keystone M. Co. is operating a 30-ton cyanide plant. The output each month amounts to \$40,000.

The De Lamar Extension M. Co. has incorporated at Salt Lake City, Utah, to operate a group of six claims adjoining the De Lamar mine, near De Lamar. R. B. Cameron, W. T. Mitchell, M. R. Stewart, D. S. Truman, L. F. Harr, E. E. Sanders and J. T. Scott are the directors.

Electric power is to be substituted for steam in operating the De Lamar mine and mill plant at De Lamar.

At the Blossom mine, near Searchlight, twenty-four men are at work and ten stamps are dropping in the mill. The main shaft is down 350 feet and a gasoline hoist is in operation. A drift is being run south at the 330-foot level.

Okey & Parsons have resumed operations on the Little Bug and the Big Bug claims near Searchlight.

LYON COUNTY.

Manager F. Leonard, at Sutro, says operations have begun on the tunnel to unwater the south end of the Comstock by the Gold Canyon Extension Co. This tunnel will begin at the end of the Sutro at the Alta shaft and extend to the Dayton shaft, 8300 feet. It will run on the vein and open up the mine at an average depth of 1000 feet.

The cyanide process is to be added to the mill of the Comstock Tunnel Co. at Sutro, says Manager F. Leonard. It is estimated the tunnel waste dump contains 100,000 tons of low-grade ore that will be cyanided.

NYE COUNTY.

F. Work, superintendent of the Hannapah Co.'s mines east of Butler, says drifting has begun at a depth of 150 feet in the incline.

STOREY COUNTY.

The directors of the Con. New York M. Co. have decided to resume work in the mine as soon as arrangements can be made. A body of gold-bearing ore exists on the 900 level. An electric hoist will be put in.

The Hap-Hazard mining location in Flowery district, near Virginia City, has

been leased by F. F. Babcock for one year. The property was formerly known as the Adriatic mine.

The water in the Chollar combination shaft on the Comstock lode fell 2 inches during the past week and stands 163 feet 2 inches below the measuring point in that shaft, reports Manager Ryan. At the C. and C. shaft elevator No. 1 is in steady operation except when stopped a few hours each day to save the expense of pressure water taken from the surface. The mine water is being held below the 2150-foot level station. The experimental test of the three pumps in the new pumping station on that level having been a success, arrangements are being made for the lowering of the water to a greater depth, with these pumps and the hydraulic elevators working in combination.

At the Utah Con. mine, on the Comstock, near Virginia City, they are dismantling the steam hoist plant and preparing a foundation for an electric hoist.

WHITE PINE COUNTY.

Manager P. C. Weber of the Sapho M. Co. says operations will be resumed at the Sapho mine at Ely.

M. L. Requa of San Francisco, Cal., has bought a group of four claims adjoining the Ruth group, which he bought last month, near Ely.

The Pilot Knob Copper Co. will resume development on their mines near Ely, adjoining the holdings of the New York & Nevada C. Co. on the west.

NEW JERSEY.

HUDSON COUNTY.

It is reported from Bayonne that the Standard Oil Co. has obtained control of the Orford Copper Works, adjoining the plant of the Standard Oil Co.

NEW MEXICO.

SIERRA COUNTY.

A. J. Hirsch of El Paso, Texas, manager of the Prosper G. M. Co., near Hillsboro, says he will install a concentrating mill of forty tons daily capacity and of the Huntington type. W. Miller has bought the Snake and Opportunity mines and has an option on the Dell mine, which adjoins the Richmond mines on the west. W. A. Farish of Salt Lake City, Utah, is manager.

The Wix M. Co., near Hillsboro, owned by Chicago men, have fifty men at work and expect to install a 100-ton plant within six months.—The Richmond G. M. Co. will build a railroad from Lake Valley to Hillsboro, a spur to run from Hillsboro to the Richmond mines.—The Lake Valley M. Co., at Lake Valley, has 100 men working.

SOCORRO COUNTY.

T. J. Curran of Denver, Colo., president of the Mogollon G. & C. Co., working near Cooney, says their mill is in operation. It has a capacity of 200 tons a day and has a cyanide plant connected with it. Ore bins have been built of 800 tons capacity. The ore carries gold and copper. The company, which is composed of Denver and New York men, owns, besides the Cooney group, twenty-one other claims in the vicinity. Machine drills are being installed.

OREGON.

BAKER COUNTY.

The 20-stamp mill at the Psyche mine in Greenhorn district, near Sumpter, is in operation, says Manager Fawcett. The stamps are 1050 pounds weight and the mortars the wide, deep discharge type.

Superintendent J. McLeod of the Ross Gulch mine, near Sumpter, says he will continue the drifts being driven and will resume sinking the shaft.

President Costello of the Storm King M. Co., operating the Storm King group, near Sumpter, says a road will be built connecting with the Baby McKee and additional machinery put in.

At 600 feet in the Oregon Monarch tunnel, near Sumpter, Superintendent T. Moffatt says a 6-foot vein of milling ore assaying \$0 has been struck.

A strike of ore carrying a shoot of sylvanite is reported from the Riverside group of claims on Snake river below Huntington, and owned by J. Baisley.

The ore shoot at the Golconda mine, near Sumpter, that has been drifted on in the tunnel level and proved for 250 feet, was struck last week on the 100-foot level in the drift south of the shaft. Arrangements will be made to increase the plant to sixty stamps. The Columbia mine, near Sumpter, will put in forty more stamps.

At the Red Boy mine, near Sumpter, the three compartment shaft will be sunk 500 feet deeper. A station tank will be put in at the 200-foot level and work done at this station. Two pumps will be installed and the machinery of the hoist overhauled. By June 1st work on the

electric power plant will begin. Secretary J. A. Howard of the Red Boy Co. says their mill will not be shut down during these developments, as previously reported.

GRANT COUNTY.

At the Alamo mine, at Alamo, the drift on the main vein is 100 feet long, bringing the face under the workings in No. 2 tunnel. Men are drifting on the adit level. It is proposed to install a mill in the summer, says the American.

JOSEPHINE COUNTY.

The Pease hydraulic mine on Upper Grave creek, near Grant's Pass, has installed an additional plant.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Glohe M. Co. have had their plant in operation since Feb. 1, and their shaft is down 150 feet, says Superintendent Wade.

The Jupiter G. M. & M. Co., in which Colorado Springs, Colo., men, are interested, is operating the Minerva and Gustin groups on Blacktail gulch, near Deadwood. The Minerva mill has been remodeled and a cyanide plant added, both being able to handle 150 tons of ore per day. The plant is expected to be in operation by March 15. The mill has forty stamps. The company owns a water right in Blacktail gulch sufficient to supply a plant of 500 tons capacity.

Another ore body has been opened up near Lead on the southerly extension of the Homestake belt by the United Ruby G. M. Co., operating on Bear Butte creek. They are taking out free-gold quartz.

The new plant at the shaft of the Anacoda G. M. Co., on the divide between Elk and Bear Butte creeks, near Lead, is in operation.

E. P. Farnham of Central City, operating at the head of Falsebottom creek, near Deadwood gulch, reports having opened up a body of gold ore assaying \$16. The group lies in the phonolite belt and the ore is phonolitic.

In Spruce gulch, $\frac{1}{2}$ miles from Deadwood, the Lexington Hill G. M. Co. has bought 230 acres of mining property, including the mines and cyanide mill of the Highland Chief M. Co., the Lexington Hill group, the Belle Eldridge, Annie and the Cohins millsite on the gulch. The claims all lie in one group. The company proposes to enlarge the Highland Chief mill of twenty stamps and leaching tanks capable of treating forty tons per day. In addition to this another mill of 200 tons daily capacity will be built farther down the gulch, and a power plant will be built in Deadwood, the power to be transmitted by electricity. The proposed new cyanide mill will not only handle ore from the company's ground, but custom ore also. The company is composed of T. F. Cornforth of Denver, Colo., H. F. Wells at al of Boston, Mass., and H. Bischoff, of Deadwood.

UTAH.

The Salt Lake Tribune says: February in the ore and bullion market closed on settlements aggregating \$2,039,500, as compared with \$2,036,810 for January, and with \$1,434,900 for February, 1902. The output of copper reached a total of 3,411,590 pounds, divided as follows:

	Pounds.
American.....	675,000
Bingham Con.....	800,590
Highland Boy.....	1,204,000
United States.....	732,000
Total.....	3,411,590

In the output of each of the plants except that of the American S. & R. Co., the copper hullion carries gold and silver.

BEAVER COUNTY.

Manager F. H. Lathrop of the Williams group, adjoining the Old Hickory, below Milford, says development work has begun.

R. L. Nolf, secretary of the Milford G. & C. Co., says work on its mines near Milford will begin April 1.

Manager Farnsworth of the Horn Silver mine, at Frisco, says he will begin shipments to the smelter of the zinc ore which they have blocked out.

DAVIS COUNTY.

C. K. Rowland and associates of Salt Lake City, of the Lake Shore Gas & Oil Co., will begin drilling operations on their holdings along the shore of Great Salt Lake, southwest of Farmington. They expect to sink 2500 feet.

JUAB COUNTY.

Manager C. E. Loose of the Grand Central M. Co., at Eureka, reports having opened up in their north workings a body of ore 60 feet wide carrying values in gold, silver, copper and lead.

Superintendent J. T. Williams of the Gresbeck-Whitney-Transvaal mine, near

Eureka, says work has been temporarily suspended.

At the Carisa mine, near Eureka, a 4-drill compressor is being set up.

Manager Allen of the Centennial Eureka mine, at Eureka, has decided to start exploring the ore bodies lying below the 1600-foot level, and to do this the main shaft will be sunk 400 feet below the present deepest workings. The shaft will be enlarged to three compartments, the present arrangement being a double-compartment shaft and a manway. This is to provide room for pump columns in case a large body of water is struck in the new ground.

Work on the Selma group of claims, in North Tintic, near Eureka, has been resumed under Superintendent L. C. Peterson. The property is being developed through the tunnel, which is in 325 feet.

Engineer Rohlfing, for the Bullion-Beck Co., near Eureka has completed maps of their ground dividing all the levels from the 200 to the 1600 into blocks of 100 feet, which will be leased and the royalties regulated by net value of ore taken out. The company's hoisting plant and blacksmith shop will be at the disposal of the leasers, who will pay a fixed price for the number of cars of ore or rock hoisted.

Ore shipments have resumed from the Victor-Boss Tweed, near Eureka, says Manager E. V. McCune. At present he is stopping on the 300 and 400 foot levels.

Ore shipments for the week ending Feb. 28 from the Tintic district amounted to 139 carloads, and for the month 511 carloads were forwarded to the smelters, distributed among the mines as follows: Ajax 3, Bullion-Beck 15, Centennial-Eureka 163, Carisa 4, Dragon Iron mine 100, Eagle & Blue Bell 8, Grand Central 94, Gemini 37, Lower Mammoth 12, La Clede 1, Martha Washington 4, Mammoth 38, May Day 1, Noon's Iron mine 4, Uncle Sam 6, Yankee Con. 20, Star Con. 1.

PIUTE COUNTY.

The P. A. H. Franklin Co. during the past week obtained options on several properties on both the Marysvale and Kimberly sides of Gold; the Elephant, Wedge Extension and others are included.

SALT LAKE COUNTY.

The Silver Shield branch of the Franklin tunnel, near Bingham, is expected to cut Silver Shield ground by April 1. The company has installed an engine and dynamo, by which the electric locomotive is operated and the tunnel lighted.

The hoist at the Columbus Con. mine of Alta is in operation. A winze is being sunk on No. 2 fissure off from the main tunnel, where a 4-foot body of ore has been opened up.

SUMMIT COUNTY.

The Nail Driver Extension M. & M. Co. has incorporated at Salt Lake City. The company owns a bond and lease on the St. Lawrence group of claims in the Uintah district, this county. W. M. Ferry, R. Gorlinski, D. H. Porter, M. E. Fitzgerald and M. McPolin are directors. The Daly-Judge mill at Park City was given a trial run last week and is expected to be in full operation by the 10th inst.

At the Daly West, at Park City, there are 500 men at work.

At the zinc plant at Park City, operated by the Utah Metals Co., says Manager Dickerman, there are in the bins 300 tons of concentrates, divided into two classes, which will be shipped to Kansas. The first class contains 56% of the zinc and the balance mainly in sulphur, with iron and lead; the second class contains 40% iron, seventeen ounces silver and 5% lead, with the balance in sulphur, the latter finding a market at any of the smelters.

The report of President J. E. Bamberger of the Daly West M. Co. of Park City for the year ending Dec. 31, 1902, shows that the total sum of \$1,827,585.72 was received for ore during the year. Dividends aggregating \$1,044,000 were paid during the same period. To the end of 1902 this company has paid in dividends \$2,259,000. The mill superintendent, F. W. Sherman, reports that since the introduction of the slimes plant, with sizing tanks and settling vats, the lead values in the mill tailings have been reduced about one-half and silver values $\frac{1}{2}$ to 2 ounces per ton, equivalent to 177 tons of lead and 90,000 ounces of silver, besides reduction in cost of transportation and treatment of 500 tons of silica eliminated by the improvements made in the plant.

The reconstructed mill at the Daly-Judge mine, near Park City, resumed operations this week.

TOOELE COUNTY.

L. Harris, manager of the Sunshine M. Co.'s mines and mill at Sunshine, Camp Floyd district, says the plant will be remodeled, additional presses put in and made to handle the full output of that character from the mill. The mill is to be overhauled and its capacity increased.

UTAH COUNTY.

In the Goodsell M. Co.'s mine, near American Fork, they have opened up 4 feet of ore in the drift off the 207-foot level, showing \$2.50 in gold, with values in lead and silver.

The Uintah Oil Co. will drill a 12-inch well on their holdings near Colton. The well will be put down 1500 feet, but the rig to be put up will have a capacity for 3500 feet.

WASHINGTON.

FERRY COUNTY.

Ewell & Galloway have begun operations at Torado Meadows, near Republic, on the Long Green mine and will sink a 100-foot shaft. Machinery for the Lucile Dreyfus is on the ground. Work will be resumed on the Violet mine, near Republic. The tunnel to crosscut the ledge, already in 150 feet, will be extended another 100 feet. At the San Poil mine the work of sinking the winze below the lower tunnel level was started last week. The bottom is in pay ore and it is proposed to sink a new working shaft from the surface and equip it with heavy hoisting machinery.

J. L. Harper, having bonded the Gold King mine, near Republic, says the incline shaft was sunk under the vein and at 32 feet cut 3 feet of ore, with an 18 inch shoot on the foot wall assaying \$30. He will put up a whim on the shaft and start increased development work.

Work at the Lone Pine-Surprise mine, near Republic, was resumed this week, says C. P. Robbins, president of the company.

KING COUNTY.

The Seattle Iron & Steel Co. has been incorporated and will build at Seattle iron furnaces with 200 tons daily capacity, and a 100-ton steel plant and rolling mill. They propose to work magnetic ores from deposits of Texada island, B. C., and intend ultimately to increase the plant by addition of tin plate mills and tube pipe works. They will take over the Pacific Steel Co.'s plant at Irondale, Wash.

OKANOGAN COUNTY.

The Slate creek platinum claim in the Similkameen district, near Loomis, owned by H. Blair of Vancouver, J. M. Bowhead of London and Similkameen men, will be developed in the spring.

At the Six Eagles group, near Loomis, they are driving a tunnel, in 1008 feet, and expect to strike the Ohio ledge in 250 feet farther, giving a vertical depth of 800 feet. G. L. Brown of Mansfield, O., one of the directors, says that as soon as the ledge is cut a concentrating mill will be installed, the power for which will be secured from an electric plant to be built at the Similkameen falls. Temporarily there will be a plant of 1000 H. P., but later increased to 10,000.

STEVENS COUNTY.

Boyles Bros. have taken their diamond drill outfit to the Colville group in the Flat creek district, near Bosshurg. The Colville group is in lime and the ore carries lead. It is operated by P. Watlet, who is driving a 500-foot tunnel in the property.

The Little Giant M., M. & S. Co., operating 3 miles east of Rock Cut and 22 miles from Marcus, reports a strike in its 50-foot shaft showing an ore body 36 inches wide which assays copper 15%, silver seven ounces, gold \$2.68. G. W. Reynolds of Marcus is president and manager.

Machinery for the Jay Gould mine, near Chewelah, is on the ground. The shaft will be sunk to the 300-foot level.

WYOMING.

UINTA COUNTY.

A body of oil-bearing limestone shale is reported found on Slate creek, 11 miles north of Kemmerer. The outcrop is 40 feet thick. Casey & Co. of Kemmerer have located 15,000 acres. It is 1 mile north of the Kemmerer coal fields. Manager C. W. Short of a St. Louis company is sinking a well at Fossil.

The Michigan-Wyoming Oil Co. are at work north of Evanston.

The Atlantic & Pacific Oil Co. are preparing to begin work at Spring valley.

The Idaho-Wyoming Con. rig at Fossil is drilling.

The American Con. rig on section 34, Spring valley, is drilling. The old casing has been removed and heavier substituted.

FOREIGN.

BRAZIL.

Copper is reported to occur in various parts of Bahia district. The Bahia Exploration Co., an English concern, has recently acquired a large area of copper-bearing land and intends to commence mining and smelting hornblende schist. Samples are said to contain 2% to 40%

copper, the average being about 4%. The mine is 50 miles west of the station of Jaguarary, on the line of the Bahia & San Francisco Railroad. The company is making experimental borings.

BRITISH COLUMBIA.

The Chinese placer miners are starting out for the spring work along the banks of British Columbia rivers. From Lillooet it is reported the Chinamen and Indians have made an early start to their grounds on the Fraser river, and from East Kootenay it is learned the Chinese companies are preparing for a heavy season on Wild Horse creek.

At the Granby mines at Phoenix the sixty-drill compressor is in place. It will be driven by electricity in two parts, with two motors, each of 700 H. P. capacity. The motors will be in place by April 1. With the present drill capacity the average day's shipments of ore are 1500 tons, says Superintendent W. Y. Williams, and this addition will give a capacity of 5000 tons every twenty-four hours, and it is the intention to increase the smelter capacity to this figure. Williams says even if the smelter was closed in two weeks, because of lack of coke, the mines would be kept running with nearly the full present force. While little shipping could be done after the smelter and mine ore bunkers were filled, there are spaces in the mines that could be filled with broken ore. Besides this be has development work to be done and this will give a chance to do it, not having air enough, the drills being used almost entirely for breaking ore.

Two drills are being temporarily run by steam in the upper end of the glory hole at the Knoh Hill mine, near Phoenix.

Last week the Mother Lode smelter was blown out, on orders from the head office in New York City, on account of the shortage in the supply of fuel. On M. R. Feeney's claim, the Florence, on the North Fork of Kettle river, \$20 ore was struck last week in a crosscut from the bottom of a 50-foot shaft. The Sunset smelter is still running at Boundary Falls, but expects to blow out as the coke and coal supply is limited and none coming in from Fernie.

A New York and Cincinnati syndicate has bought the J. E. Bate group of claims in Aspen Grove, Similkameen, for \$75,000, and the transfer of two other properties in the camp are reported about to be made.

Work will begin this week in opening up the Eleven of England claim in Stanley by the Cariboo Con. Co. Machinery will be installed, says M. Bailey, manager.

The manager of the Velvet mine, near Rossland, reports returns from smelters—129 tons first-class ore yielded 130 ounces gold, 10,000 pounds copper; net value from smelter, \$2540; 148 tons fines (third-class ore) yielded sixty ounces gold, \$350 pounds of copper; net value, \$1114.

No. 1 mine at Extension, on Vancouver, will be abandoned this month as worked out. The last remaining coal is being taken out.

M. Mackay of Atlin says he will open up the coal field which he has found on the Tatla river, a branch of the Stikine. The outcrop extends for $\frac{1}{2}$ miles. The mine is 10 miles from Telegraph creek and to get the coal out will require the construction of a tramway for that distance.

The management of Le Roi No. 2 Co. at Rossland propose to install a concentrating plant to handle the output of the Josie and No. 1 mines and construction will begin by April 1. The War Eagle and Centre Star mines are also planning additions to their equipment.

The Granby Co. has contracted with the Dunsuir colliery, on the coast, for 200 tons of coke a day to run its smelters at Grand Forks, says J. P. Graves, manager of the company at Spokane, Wash. They had but twelve days supply of coke on hand the 1st inst. The strike situation at the Crow's Nest Pass collieries seems to show no new developments.

The Crow's Nest Coal Co. has sold the stock of general merchandise in the company's stores at Fernie, Michel and Morrissey to a local company, and hereafter the company will devote itself exclusively to coal mining.

The Morrison Mines, Ltd., owning the Morrison mine in Deadwood camp, and the Athelstan mine in Wellington camp, owned by the Athelstan G. & C. M. Co., Ltd., have consolidated, the latter company ceasing to exist as such. Development work on both properties will be started this month. F. H. Oliver of Spokane, manager of the Morrison Co., has contracted to supply the Boundary Falls smelter with an initial tonnage of 50,000 tons per annum, the freight and treatment rate to be \$1.75 per ton, said to be the lowest figure ever quoted in the Boundary district.

A strike is reported on the L. B. group in Trout Lake district. In the shaft on the L. B. claim at 35 feet a 20-inch shoot was struck, 8 inches of which is gray cop-

per, with assay values of \$16 in gold, 300 ounces in silver, 5% copper and 30% lead. The remainder is quartz carrying \$80 per ton. The property is being worked by Superintendent G. W. Stead for Philadelphia men, who also own the Ethel group of three claims.

CANADA.

NORTHWEST TERRITORY.

The Grafton mine, near Whitehorse, north of Atlin, B. C., is producing ten tons of ore a day, being the first regular shipping mine of the district. It is the intention of the owners to install a plant this spring to continue development work and bring their shipments up to fifty tons a day.

MANCHURIA.

According to the Amur Gazette, gold in paying quantities has been found by the Chinese on the banks of the Amur river, opposite the Russian town of Blagovestchensk. The deposits extend for several miles along the river.

MEXICO.

CHIHUAHUA.

M. B. Place, manager of the San Jose M., M. & R. Co., operating at Jan Jose del Sitio, 60 miles northwest of Parral, says they will build 8 miles of railroad from the Gabalana mining district to San Jose del Sitio. The grading of the road, a 3-foot gauge, will be finished next week. Two 20 ton locomotives and twenty-five flat cars will be the equipment. The mill at San Jose del Sitio has forty stamps and handles 250 tons daily. A store is to be put in at the mill when the road is opened up.

The Santa Eulalia mines, at Santa Eulalia, will be developed by M. D. Gatlings of Clarendon, Texas.

There are 40,000 tons of ore being shipped per month from Parral. In addition to this, the Refugio mill is treating 100 tons per day, the Parral M. Co. is treating eighty tons by lixiviation, the Tecolotes mill 200 tons and the Montezuma mill 150 tons. There are four sampling works—the Torreon smelter, No. 25 smelter of Monterey, the American S. & R. Co. and Flynn's, dealing principally with the Mapsmi smelter.

The Guggenheim Ex. Co. is shipping ore from the dump of the Veta Grande mine, near Parral, which runs twenty ounces silver. They are shipping 2500 tons per month from this mine, and 3000 tons from the Quebradillas.

The La Iguana mine at Parral is to resume operations. The pumps were started this week.

The Caballo Prieto silver mine, near Parral, has been bonded to J. P. Hutchinson, of Chihuahua. Work will begin next week.

A. Garcia is treating 3500 tons of ore per month at his lixiviation plant near Parral, and is shipping 2500 tons in addition.

The Hidalgo M. Co., near Parral, is shipping 1000 tons per month from the Moreno mine and 2000 tons from the Presaga.

A. B. Callender, of Torreon, and A. L. Rossin, of Parral, are working the Maria mine, a mile east of Parral, and are down 70 feet.

W. A. Rodgers, manager of the Red Hill mines, near Parral, reports the mill running full capacity.

NUEVO LEON.

A. A. Graham, manager of the Marcoro mine in the Rinconada district, near Monterey, has made the first shipment of ore, consisting of 500 kilograms, which averaged 22% lead.

OAXACA.

The Sierra Juarez M. & M. Co., operating in the Sierra Juarez mountains, 40 miles northeast of Oaxaca, G. Clark superintendent, have their 10-stamp mill in operation and have taken out bullion from the first month's cleanup \$125,000 gold.

The San Francisco mine, in the Ocotlan district, has been sold for \$281,100 to the Los Reyes M. & M. Co. of Perez.

The San Francisco and Candelaria mines, in Ocotlan district, have been sold to Los Reyes G. M. & M. Co. of Detroit, Mich., which company also owns the gold mines of the Pares district, and where they have in operation a 20-stamp mill.

SONORA.

(Special Correspondence)—The Cerro Prieto mines, 35 miles southeast of Magdalena, have been sold to the Nogales C. Co. of Nogales, Ariz., for \$600,000. The Nogales Co. will erect a 100-stamp mill in addition to the twenty stamps now in operation, and also put in a cyanide plant. Enough ore is already blocked out to warrant putting up the plant. The first payment of \$50,000 on the property has been made. They have a vein of gold ore

varying from 15 to 75 feet in width, reported to run \$5 per ton. The property comprises 325 acres. They have an abundance of wood. Have a pumping plant in operation. The pipe line is 3 miles long. C. N. Thomas, Nogales, is general manager.

The St. Bibiana M. Co. of Nogales, Ariz., is operating its property 35 miles east of Magdalena and have broken into the "Antigua" workings, 500 feet in length. The ledge is 4 to 12 feet wide, carrying gold and silver. The company will erect a concentrating plant. They have several tunnels on the property besides shafts. T. J. Byran, president; J. S. Hurst, manager; L. F. Swain, secretary and treasurer.

O. M. Roberts, manager of the Henrietta placer mines at La Cienega, intends putting on a dredger. These placers are located in the Altar district and have produced a large amount of gold and are still producing.

The Sonora M. & M. Co., near Tubutama, are contemplating the erection of a large milling plant. The Onelda G. & C. Co. of Nogales, Ariz., also intend erecting a plant for treating ores.

The Yerkes G. M. & M. Co., J. C. Underwood, general manager, Nogales, Ariz., will have their 20-stamp mill in operation within the next thirty days. Roy & Titcomb are doing the work. They have several shafts on the property, the deepest being 220 feet. The ore mills \$12 on the plates. The mine is located in the Altar district, 35 miles west of the railroad.

Magdalena, Feb. 28.

KLONDIKE.

Dawson reports tell of pay dirt located on Duncan creek, extending from 7 above to 106 above. Numbers 53 and 54 have produced \$100 a day. It is 95 feet to bedrock. No. 106 has 2 feet of pay. The creek would have been worked by heavy machinery this winter but for the failure of the steamer Prospector to reach Dawson last fall with machinery and supplies.

PERSONAL.

F. S. ADAMS, a mining man of Mexico, is in Tonopah, Nev.

C. E. SAVIERS of Seattle, Wash., is in Chihuahua, Mexico.

T. F. MILAND, formerly of Guadalajara, Mexico, is in Tonopah, Nev.

M. KYLE has been reappointed U. S. Surveyor-General of Nevada.

J. McLEOD is superintendent of the Ross Gulch mine, near Sumpter, Or.

J. FITTING is superintendent of the Federal M. & M. Co., near Gillett, Colo.

OGDEN HOFFMAN, M. E., has returned to San Francisco, Cal., from Honolulu, H. I.

P. C. WEBBER of Ely, Nev., a director of the Sapho M. Co., is in Salt Lake City, Utah.

L. REED, manager of the Sahuayan mine, near Chihuahua, Mex., is in Pittsburgh, Pa.

MANAGER J. J. DALY of the Daly-Judge mine at Park City, Utah, is in California.

T. F. SINGISER, manager of the American Flag M. Co. at Park City, Utah, is in New York.

F. H. STANWOOD, of Boston, is examining mining interests in Eastern Arizona and Colorado.

E. C. SMALL of Chicago, Ill., is examining mining interests at Ocampo, Chihuahua, Mex.

JESSE SCOBAY, of Washington, Ariz., is in Denver, Colo., where he will remain for some time.

E. A. BYLER, U. S. Deputy Mineral Surveyor of Cripple Creek, Colo., is in Tonopah, Nev.

L. C. PETERSON is superintendent of the Selma group in North Tintic, near Eureka, Utah.

H. STERN of the Tintic M. & S. Co. is visiting their properties at Eureka, Utah, from the East.

I. E. BUSH is metallurgist and mill superintendent of the Sunshine M. Co., at Sunshine, Utah.

F. H. PERKINS is consulting engineer of the Stockton G. M. Co., operating at Stockton, Utah.

V. M. CLEMENT has returned to Salt Lake City, Utah, from an examination of mines in Mexico.

JAMES KEEN of Kaslo, B. C., has been

elected president of the British Columbia Mining Association.

J. Q. CRITCHLOW of the Cerro de Pasco mines in Peru, is in Salt Lake City, Utah, for a brief vacation.

J. MCSORLEY is manager of the New York Bonanza at Park City, Utah, vice R. G. Wilson, resigned.

P. W. MADSEN, manager of the Century mine at Park Valley, Utah, has returned from a trip East.

W. GUY SCOTT, superintendent of the Black Oak mine, near Soulsbyville, Cal., is in San Francisco, Cal.

J. T. HODSON of Salt Lake City, Utah, manager of the Lincoln mine, near Pearl, Idaho, is in Pearl, Idaho.

W. L. WATTS, E. M., has returned to Los Angeles, Cal., from the oil fields of Santa Barbara county, Cal.

A. A. BROWN of Silverton, Colo., is manager and superintendent of the Stony Pass M. Co., near Silverton.

P. JOHNSON has resigned as general manager of the British Columbia C. Co.'s smelter at Greenwood, B. C.

SUPERINTENDENT F. AMES of the Wauconda mine, near Lead, S. D., is in the East on company business.

R. W. PURDURN of the Belle mine at Thunder, Idaho, has returned from an extended trip to Pittsburg, Pa.

MANAGER F. R. CULBERTSON of San Francisco, Cal., has gone to the Chloride-Bailey mine, Trinity county, Cal.

A. G. LARSON, general superintendent of the Rossland-Kootenay Co., at Rossland, B. C., is in Spokane, Wash.

O. B. TODHUNTER, general manager of the Buckeye M. Co., has returned to Cincinnati, O., from Tombstone, Ariz.

W. I. SNYDER, manager of the California mine at Park City, Utah, has returned from a business trip to Chicago, Ill.

L. HARRIS, manager of the Sunshine M. Co., Camp Floyd district, Utah, has returned to Sunshine from Montana.

C. R. MILLEN of Philadelphia, Pa., vice-president Tonopah M. Co., has been in Tonopah, Nev., for the past week.

J. B. FARISH of Denver, Colo., has been examining the Crestone-Colorado mine at Minas Prietas, Sonora, Mexico.

SUPERINTENDENT J. R. TREGLOAN, JR., of the South Spring Hill mine, near Amador City, Cal., is in San Francisco, Cal.

A. J. ANDREWS, part owner of the Dollie B. mine, near Leadville, Colo., has returned to Montreal, Canada, from Leadville.

L. HARRIS, manager of the Sunshine mines and mill at Sunshine, Utah, has gone East to confer with the company's officials.

A. MOORHEAD is superintendent, Sidney Reeves millman and assayer and J. Keith foreman Echo M. Co., near Mojave, Cal.

DIRECTOR F. ZEITLER of the Champion Mines Co. has returned to San Francisco, Cal., from their mines near Nevada City, Cal.

E. W. CARSON, formerly of New Almaden, Cal., is now superintendent Oceanic quicksilver mine, San Luis Obispo county, Cal.

J. MCKANE of British Columbia, president and general manager Golden Anchor M. Co., is in Tonopah, Nev., looking over his interests.

G. J. CURRAN, president of the Mogollon G. & C. Co., operating near Cooney, N. M., has returned to Denver, Colo., from a trip to their mines.

BRUCE GLIDDEN, formerly general counsel for the Woods Investment Co. of Cripple Creek district, Colo., is now in Tonopah, Nev.

M. B. PLACE of Pittsburg, Pa., manager of the San Jose M., M. & R. R. Co. of San Jose del Sitio, Chihuahua, Mexico, is at the mines.

S. T. PEARSON, manager of the Nevada M. Co.'s mines and mill at Berlin, Nev., made a short trip to Salt Lake City, Utah, last week.

F. P. MILLS, formerly superintendent for the Merced M. Co. at Coulterville, Cal., is superintendent of a coal mine at Robson, W. Va.

F. TURNER, who has been traveling through Sonora, Mexico, the past four months, looking over the mining sections, is now in New York.

R. COE, part owner of the Scorpion group of mines, near Granite, Or., has

returned from Vermont, where he has been spending the winter.

J. T. THOMPSON, superintendent of the Kenross mine at Whiskey Slide, near Mokelumne Hill, was in San Francisco, Cal., for a few days last week.

FRANK FITCH, formerly with Pride of West mine, Washington, Ariz., has charge of the qualitative laboratory at School of Mines, Tucson, Ariz.

E. W. WALKER, formerly chief engineer, is assistant superintendent of the Tombstone Con. M. Co., at Tombstone, Ariz., vice H. J. Gray, resigned.

P. J. QUEALLY, manager of the Kemmerer coal mines, has returned to Kemmerer, Wyo., from an examination of the coal fields of Emery county, Utah.

G. H. ROBINSON of Salt Lake City, Utah, manager of the Tintic M. & D. Co., and D. McViehe, manager of the Bingham Con. Co., are in Denver, Colo.

W. MCCORNICK is in Salt Lake City, Utah, from the placer mines of Siberia operated by his company under a concession from the Russian Government.

J. J. LONG is manager of the Santiago M. Co., owning the Quebradillas mine on the Veta Grande, near Parral, Chihuahua, Mex. R. Long is superintendent.

F. A. KENNEDY of the Cincinnati-Utah Oil Co. has returned to Salt Lake City, Utah, from Duluth, Minn., where he has been spending several months with his family.

F. W. BRADLEY AND H. C. PERKINS of the Mariposa C. & M. Co. and Manager Birch of the Bunker Hill & Sullivan, have returned to San Francisco from Mt. Bullion, Cal.

L. L. PATRICK of Denver, Colo., has taken the general management of the Tonopah Syndicate G. M. Co. of Tonopah, Nev., and also the Plute group at Hanabap, Nev.

J. W. GALLAGHER, former superintendent of the Beaver Con. mines in Beaver county, Utah, has left Salt Lake City, Utah, for the Copper river district in Alaska.

EMERSON GEE has resigned as manager of the California King G. M. Co., and is now consulting engineer for the same company with headquarters at Los Angeles, Cal.

N. DUNYON, former assistant superintendent of the Daly-West mines, Park City, Utah, is superintendent of the Daly-Judge mines at Park City, vice J. McSorley, resigned.

F. M. LOCKWOOD, till recently superintendent of the Accident mines, Cripple Creek, Colo., has been appointed manager of the Gold Cord Co., operating the War Eagle, Cripple Creek.

C. C. BURGER, assistant to J. H. Hammond, is at Tonopah, Nev., examining the properties of the Tonopah Co., to determine as to future working plans and the treatment of the ores.

C. S. FOSSELMAN of Welser, Idaho, manager of the Excelsior Placer M. Co.'s properties in Lewis and Clarke county, Mont., has returned to Welser from a business trip to Salt Lake City, Utah.

G. D. CASE has resigned as superintendent of the Washoe smelters of the Amalgamated Copper Co. at Anaconda, Mont., and has accepted a similar position with the Copper Range Co., near Houghton, Mich.

A. WINSLOW, manager of the Liberty Bell mine at Telluride, Colo., accompanied by Superintendent Bosqui of the cyanide mill of that property, is in Utah, examining the milling methods of the principal camps.

GODFREY D. DOVETON, late metallurgist Thos. F. Walsh's Camp Bird and Camp Bird Ltd., and Chester W. Purlington, formerly of Mining Division U. S. G. S., have formed a partnership as consulting mining engineers and metallurgists, with offices at 319 Majestic Bldg., Denver, Colo.

Commercial Paragraphs.

J. D. HURLEY AND A. B. HOLMES, formerly connected with the Standard Pneumatic Tool Co., are now associated with the Rand Drill Co., in the Imperial pneumatic tool department.

At Seattle, Wash., the Seattle Iron & Steel Co. has incorporated, capital \$6,000,000, to build an iron furnace of 200 tons daily capacity, a 100-ton steel plant and a rolling mill, to work magnetic ores of Texada Island, B. C., and to absorb the

Pacific Steel Co.'s plant at Irondale, Wash.

On May 1st, the Allis-Chalmers Co. will remove their general offices from the Home Insurance Bldg. to the New York Life Bldg., corner of La Salle and Monroe Streets, Chicago—another indication of the progressive spirit which prevails in the management of this strong industrial establishment. The Allis-Chalmers Co. has for the past two years been expending large sums in betterments at their various plants in Milwaukee, Chicago and Scranton, to enable them to give their customers the best possible service in point of economy and quick deliveries. The new offices of the Allis-Chalmers Co. will provide ample space for the various sales departments and general business offices. They write that during the past two months, orders for either engines, mining machinery, rock crushing machinery, sawmill machinery and flour mill machinery were booked from every State in the Union, besides the following foreign countries: England, South Africa, Mexico, Canada, Chile, Central America, Brazil, British Columbia, Bolivia, Hawaiian Islands, Peru, Alaska, China and the Philippine Islands.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., makers of electric traveling cranes, advise that the sales of their products continue satisfactory. They send reports of sales of fifty-five cranes from Jan. 1 to Feb. 26. Among the orders booked within this time are the following: Chicago & Eastern Illinois R. R. Co., Danville, Ill., three cranes; Western Tube Co., Kewanee, Ill.; Westinghouse Machine Co., East-Pittsburg, Pa.; South Penn. Oil Co., Folsom, W. Va.; Pittsburg Plate Glass Co., Ford City, Pa.; Ansonia Brass & Copper Co., Torrington, Conn.; Fairbanks, Morse & Co., Beloit, Wis.; St. Paul Foundry Co., St. Paul, Minn.; Ingersoll-Sergeant Drill Co., Phillipsburg, N. J., fourteen cranes; American Bridge Co., Ambridge Works, Economy, Pa., five cranes; Standard Steel Works, Burnham, Pa.; City of Boston, Water Department, Boston, Mass.; Beloit Iron Works, Beloit, Wis.; International Steam Pump Co., Laidlaw-Dunn-Gordon Works, Elmwood Place, Ohio; Wheeling Steel & Iron Co., Benwood, W. Va.; Coe Brass Mfg. Co., Torrington, Conn.; McConway & Torley Co., Pittsburg, Pa.; Ironton Engine Co., Ironton, Ohio, two cranes; Joseph T. Ryerson & Son, Chicago, Ill.; Hammond Iron Works, Struthers, Pa.; Cambria Steel Co., Johnstown, Pa.; American Bridge Co., Pencoys Plant, Pencoys, Pa.; C. A. Lawton & Co., De Pere, Wis.; Perry-Mathews-Buskirk Stone Co., Bedford, Ind., two cranes; Toledo Machine & Tool Co., Toledo, Ohio; American Sheet Steel Co., Wellsville Works, Wellsville, Ohio; Landis Tool Co., Waynesboro, Pa., three cranes; Goodman Mfg. Co., Chicago, Ill.

Books Received.

"Analysis, Detection and Commercial Value of Rare Metals," by Dr. J. Ohly, Ph. D., is the title of a little volume of 216 pages, just from the press. It is a treatise on rare metals and their compounds, and is for the use of assayers, chemists and prospectors. Some of the rarer metals treated in this work are platinum, selenium, tellurium, uranium, vanadium, etc. It will prove a very interesting work to those interested in prospecting for these rare minerals and in their properties and uses. Price, \$3; Industrial Printing & Publishing Co., Denver, Colo.

"Elements of Steam Engineering," by H. W. Spangler, A. M. Greene Jr. and S. M. Marshall, B. S. in E. E. This is a book issued for the particular use of students and beginners in the practice of steam engineering. There is little in the book of a theoretical nature, for it inclines to the practical—teaching the use of the various types of steam engines and their accessories, including boilers, boiler room auxiliaries, engine details, valve motions, indicating and governing, condensers, multiple expansion engines, etc. To those taking up this course of study the book will prove of great service. 8vo., 275+V pages, 273 figures. Cloth, \$3; John Wiley & Sons, New York; Chapman & Hall, Ltd., London, England.

Catalogues Received.

Special Circular No. 46 of the Stillwell-Bierce & Smith-Vaile Co., Dayton, Ohio, describes the Smith-Vaile single, duplex and triplex boiler feed pumps, with full-page illustrations from wash drawings and condensed data.

Obituary.

J. V. MOORE, a pioneer and the discoverer of gold in Cook City, Montana, in 1870, died at Gardiner, Mont., March 2, aged 70.

F. C. DOBLER, superintendent of the Cornucopia mine, near Baker City, Or., was killed by a snowslide near the mine on the 3rd inst.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

- FOR THE WEEK ENDING FEBRUARY 24, 1903.
- 721,271.—RULER AND LINE GAUGE.—S. Adler, S. F.
- 721,416.—RAILWAY SWITCH.—W. J. Bell, Los Angeles, Cal.
- 721,537.—ANIMAL TRAP.—Bristol & Eberhard, S. F.
- 721,285.—IGNITER FOR GAS ENGINES.—J. Cereghino, S. F.
- 721,546.—WINDOW SHADE FIXTURE.—D. S. Dow, Seattle, Wash.
- 721,510.—DOOR SILL.—S. W. Funk, Santa Ana, Cal.
- 721,300.—DUMP CAR.—E. D. Haven, San Jose, Cal.
- 721,348.—SAFETY GAS COCK.—Jensen & Christensen, S. F.
- 721,207.—ROTARY PUMP.—J. B. C. Lockwood, Seattle, Wash.
- 721,377.—GRIPPER FOR PRINTING PRESSES.—F. I. Macauley, S. F.
- 721,231.—DOORS.—W. D. Plue, Rainier, Or.
- 721,616.—HAY STACKER.—P. E. Sner, Ellensburg, Wash.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

RULERS AND LINE GAUGES.—No. 721,271. Feb. 24, 1903. S. Adler, San Francisco, Cal. This object of this device is to provide a simple compact arrangement for the use of bookkeepers, school children, and others to enable them to draw parallel lines. It comprises a ruler of ordinary description having clamping members thereon, one of said members slides in relation to the other, short foldable graduated arms pivoted on said clamps and adapted to stand at right angles to the straight edge of the ruler, stop means to limit the movement of said arms, and the latter serving as a support for the ruler to keep the straight edge clear of the paper at all times.

SAFETY GAS COCKS.—No. 721,308. Feb. 24, 1903. L. Jensen and J. Christensen, San Francisco, Cal. This invention is designed to prevent the accidental turning on of the gas or the extinguishment of the light without the flow of gas being cut off. It consists in the combination in a safety attachment for gas cocks of a bell crank lever pivoted to the cock, the other end of its arms, a thermostatic bell and snapper, the one end of said pivoted arm, a pivoted member engaging the end of the other arm to form a toggle therewith, a spring arm connected with a gas cock and stop means on the pivoted member of said toggle adapted to engage said spring arm.

ANIMAL TRAP.—No. 721,537. Feb. 24, 1903. W. H. Bristol, of East Highlands, Cal., and G. F. Eberhard of San Francisco, Cal., assigned to The Geo. F. Eberhard Co., of San Francisco, Cal., a corporation. This invention is designed to provide a trap which will be most certain of impaling and holding rodents of all sizes. It consists of a plurality of loops or rings forming an extended passage through which the rodents enter, a spring arm pivoted with impaling teeth movable through the space inclosed by said rings, a trigger pivoted behind the base of the rings, and a trigger plate pivoted rearward of the center of the trap, whereby the entrance of the rodent within the rings is assured before the trap is sprung.

DUMP CARS.—No. 721,300. Feb. 24, 1903. E. D. Haven, San Jose, Cal., one-half assigned to J. H. Crossitt, San Jose, Cal. This device consists in an arrangement of longitudinally supported spiral channels or grooves fitted to each car rollers or travelers adapted to move in said grooves and guided so as to travel in straight lines, and pistons moving in cylinders, with means for applying air pressure to one side or the other of the piston, so that when moved in one direction the spiral will be compelled to follow the rollers, and thus lift the car to a desired level. It consists of a plurality of pistons in cylinders, the ends of the pistons to actuate them and dump the car. The apparatus is controlled by any operator by means of air passages through suitable train pipes.

IGNITERS FOR GAS ENGINES.—No. 721,285. Feb. 24, 1903. J. Cereghino, San Francisco, Cal. This object of this invention is to provide a device of simple construction and positive action and to provide means by which the timing of the explosion may be regulated according to the speed of the engine, so that ignition may take place more or less before the spark reaches the end of the compression stroke. The invention includes a screw-threaded plug fitting the cylinder and having a tapered horseshoe fixed electrode in said plug, a longitudinally perforated conical plug fitting said horseshoe and insulated from the first named plug, an electrode reciprocable in the conical plug, guides by which the electrode is prevented from turning, a plate in which a conical contact plug screws, electro-magnetic means for opening and closing the circuit he wren said electrodes, a disk connecting with the engine shaft, said disk being out of electrical connection with the shaft except for a diagonally disposed conducting segment, brushes engaging said disk, and a switch incorporated in the spark circuit adapted to engage one or the other of said brushes to operate the sparking mechanism.

Latest Market Reports.

SAN FRANCISCO, March 6, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22s 3d (standard ounce, 925 fine); New York, bar silver, 48 3/4c, refined (1000 fine); San Francisco, 48 3/4c; Mexican dollars, 33 @ 38 1/2c San Francisco, 33c New York.

COPPER.—New York: Standard, \$13.00; Lake, 1 to 3 casks, \$13.75; carload lots \$12.75; Electrolytic, 1 to 3 casks, \$13 50 @ 13 75; carload lots \$12.50; Casting, 1 to 3 casks, \$13 30 @ 13 60; carload lots, \$13 00. San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £59 15s spot per ton.

Copper has steadily advanced for several weeks past, and Lake copper is now quoted at 13 75c per pound; dealers predict 14c within a short time, as consumers seem to have laid in no stock, evidently hoping for a decline.

LEAD.—New York, \$4.12 1/2; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4 1/2c 1000 to 4000 lbs.; pipe 5 1/2, sheet 6, bar 5 1/2; pig, \$4.75. London: £12 12s 6d per long ton = 2.73c per lb.

SPELTER.—New York, \$5.15; St. Louis, \$4.60; London, £21 15s per ton; San Francisco, ton lots, 6 1/2c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9 1/2c; Hallett's, 8 1/2c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$30 6 1/2 @ 31 00; San Francisco, ton lots, 32c; 500 lbs., 32c; 200 lbs., 32 1/2c; less 33c; bar tin, \$3 35c @ 37 1/2c. London, £138 7s 6d spot.

PLATINUM.—San Francisco, crude, \$18.00 per oz.; New York, ingot, \$19 00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots: London, £8 15s; San Francisco, local, \$45.00 per flask of 7 1/2 lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 1/2c; extra, 17 1/2c; genuine, 35c; Eclipse, 37 1/2c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16 65c.

NICKEL.—New York, 50 @ 60c per lb.; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3c per lb., 3 1/2c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	\$24.00 @ 24.50
Foundry Northern	23.00 @ 24.00
Northern 2	22.50 @ 23.50
Northern 3	22.00 @ 23.00
Southern 1	23.35 @ 23.85
Southern 2	22.85 @ 23.35
Southern 3	22.35 @ 22.85
Forge	21.85 @ 22.35
Charcoal	26.00 @ 27.00
Billets, Bessemer	33.00 @ 34.00
Bars, iron	1.75 @ 1.85
Bars, steel	1.75 @ 1.80
Rails, standard	28.00 @ 30.00
Rails, light	34.00 @ 40.00
Plates, boiler	1.90 @ 2.00
Tank	1.75 @ 1.80
Sheets, 26 store	2.80 @ 2.90
No. 27	2.90 @ 3.00
No. 28	3.00 @ 3.10
Angles	1.75 @ —
Beams	1.75 @ —
Tees	1.80 @ —
Zees	1.75 @ —
Channels	1.75 @ —
Steel melting scrap	17.50 @ 18.50
No. 1 railroad wrought	18.50 @ 19.00
No. 1 cast, net ton	17.50 @ 18.00
Iron rails	24.00 @ 25.00
Car wheels	23.00 @ 23.50
Cast borings	10.25 @ 10.50
Turnings	14.00 @ 14.50

CHEMICALS.—Cyanide of potassium, 98%—99%, jobbing, 25 @ 26c per lb.; carloads, 24 @ 24 1/2c; in tins, 35c; soda ash, \$2.00 per 100 lbs.; byosulphite of soda, 2 1/2 @ 3c per lb.; caustic soda, in drums, 3 @ 4c per lb.; Cal. s. soda, bbls., \$1 25 @ 1 50 per 100 lbs; sks., \$1.05; chloride of potash, 12 @ 13c; nitrate of potash, bbls., 8c; caustic potash, 10c in 40 lb tins; borax concentrated, 7 @ 8c per lb.; roll sulphur, 4 @ 6c; powdered sulphur, 2 @ 3c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2 1/2c; sulphide of iron, 9c per lb.; copper sulphate, 5 @ 7c; chloride of lime, spot, \$3.00 @ 4.00; sulphuric acid, in carboys, 66% B, 2 1/2c per lb.; nitric acid, in carboys, 8c per lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for

No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 1/2c; less than one ton, 17 1/2c. No. 1*, 60%, carload lots, 13 1/2c; less than one ton, 15 1/2c. No. 1** 50%, carload lots, 11 1/2c; less than one ton, 13 1/2c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9 1/2c; less than one ton, 11 1/2c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10 1/2c per set; 14 oz., 40s., 9 1/2c.

CEMENT.—Germania, \$2 50 @ 2 75; Hewmoor, \$2 90; Trowell, \$2 90; Portland, \$2 50 @ 2 75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$3.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, hotted, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22 1/2c; Astral, 22 1/2c; Star, 22 1/2c; Extra Star, 25 1/2c; Eocene, 24c; Elaine, 27 1/2c; Water White, in bulk, 16c; bbl., Mineral Seal, iron bbls., 18 1/2c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26 1/2c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23 1/2c; 86° Gasoline, bulk, 21c; do., cs., 27 1/2c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22 1/2c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50 @ 55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6 1/2c; in 25-lb. tin pails, 7c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 7c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6 1/2c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6 1/2c. LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb. powdered, 9 @ 12c; fused, 25 @ 30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c per lb.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—(90% and over) per lb., \$1.25.

MOLYBDENUM.—25c. per gramme; 1000 grammes=2 1/2 lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, per lb., \$1.25.

MERCURY.—Bichloride, per lb., 90c.

PHOSPHORUS.—(American) per lb., \$1.00.

SILVER.—Chloride, per oz., 90c @ \$1.00; nitrate, 55c.

URANIUM.—Oxide, per lb., \$3.50.

ZINC.—Metallic, chemically pure, per lb., 50c; dust, per lb., 10c; sulphate, per lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

THE CALIFORNIA DEBRIS COMMISSION having received application to mine hydrauic gravel from Calaveras Development Co., in Antella Gravel Mine, near Railroad Flat, Calaveras County, Cal., draining into Independence Creek which reaches South Fork of Mokelumne River, gives notice that a meeting will be held at Room 96 Flood Building, San Francisco, Cal., March 23, 1903, at 1:30 P. M.

MINING AND SCIENTIFIC PRESS

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The Meaning of Ore.

A general impression prevails that any mineral substance containing precious or base metals in any quantity is an ore. Modern lexicographers have given the word a somewhat more restricted meaning, in which the element of economics is an important consideration. An ore is defined variously by the several recognized authorities, but, generally speaking, is now accepted to mean a mineral substance from which a metal can be extracted at a profit. According to this definition, a mineral containing possibly \$5 per ton in gold, but occurring in small quantity, and in a place difficult of access, might not be considered an ore, for the reason that possibly no profit would result in obtaining the mineral and extracting the gold, while a mineral containing less than \$2 per ton in gold, but more fortunately situated and capable of being treated at a profit, becomes an ore. A change in conditions might make a profit possible in the former case, when that mineral falls into the class of ores. Some object to the expression "gold ore," contending that gold always occurs native, and consequently mineral containing it should not properly be called an ore. As gold does not always exist in the native state, but often in combination with other elements, and as an alloy, the general term "gold ore" seems properly applicable to all minerals containing that metal, with the possible restriction at first mentioned, which appears to rest somewhat upon certain conditions of environment, and combination with other minerals, making its extraction profitless.

Deep Mining on the Rand.

The recent completion of a second deep borehole in the Cinderella Deep mine, on the Rand, in South Africa, upon finding the main reef at a depth of 3309 feet, indicates the remarkable persistence of this gold-bearing blanket. The Turf Club borehole, which reached the same reef at great depth some time since, is 14 miles distant from the Cinderella Deep,

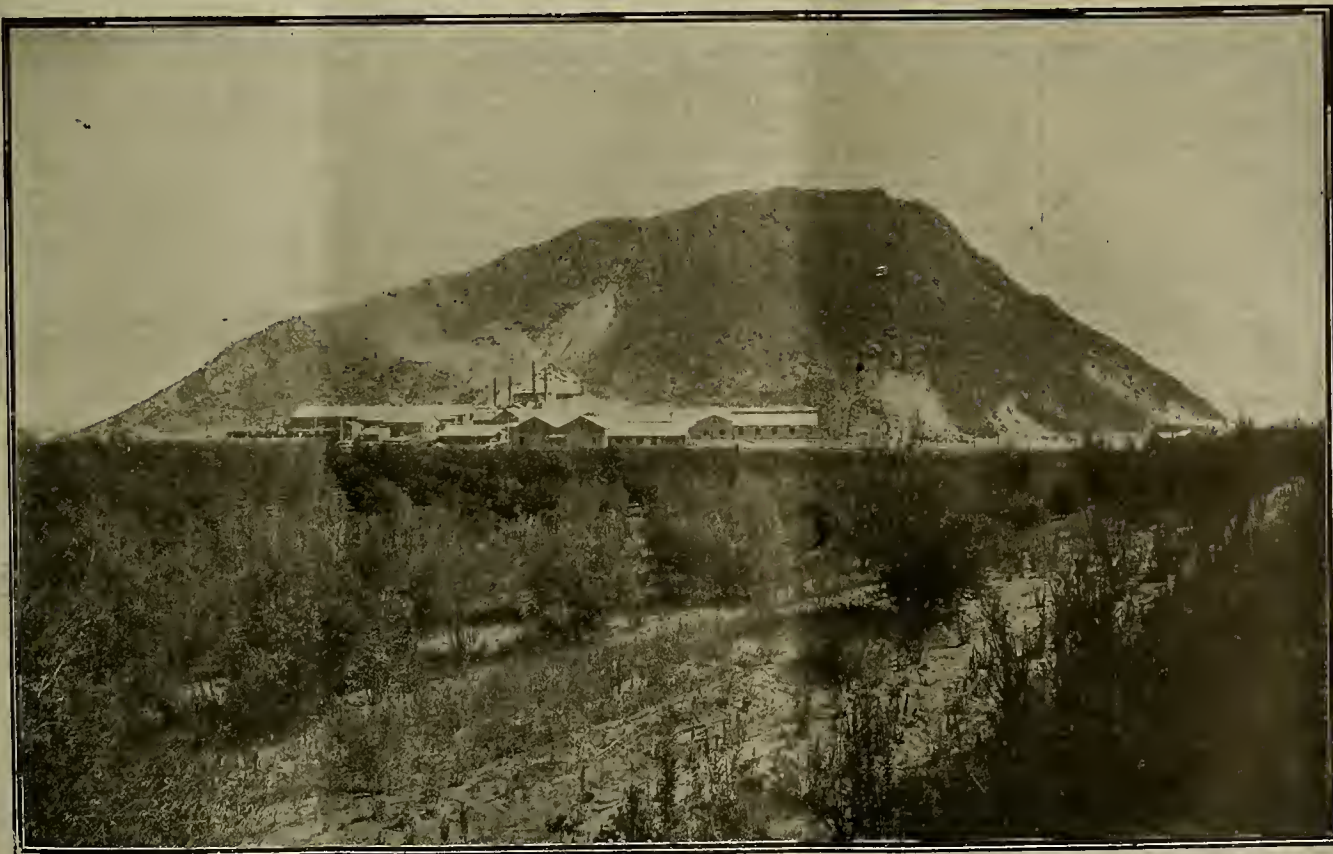


Rotary Kiln, Cement Works, Colton, Cal. (See page 166.)

indicating the probable extension of the sheet of gold-bearing conglomerate over the intervening space. Such generalization elsewhere would not only be unsafe, but would receive no attention whatever from mining men; but the extraordinary continuity of the conglomerate having been proven in other directions on the Rand, makes the assumption not unreasonable that the reef will be found in the intermediate area between the points mentioned. The questions of quantity and value are uncertain, however, and can only be determined by actual exploration, either by means of additional boreholes or by sinking deep shafts to the reef. The recent development in the Cinderella borehole is reported to indi-

cate a width of 16 feet of reef, of which 4 feet assays about \$10 per ton. Should a shaft be started this year to reach the reef at the bottom of the borehole in the Cinderella, allowing no loss of time in preparatory work, and sinking at the maximum speed thus far made on the Rand (Wolhuter, 209 feet in the month of November, 1902), it would be about sixteen months from the date of starting before the shaft would encounter the main reef. No shaft has yet made such an average record, and it is doubtful if the work could be accomplished within two years. It will also entail an expense of several hundred thousand dollars, probably not less for sinking and timbering the shaft than \$100 per foot, on an average,

which will amount to about \$300,000, in addition to the cost of the expensive surface plant necessary in such large undertakings. In some of the deep-level mines of the Rand, whose shafts will be no less than 6000 feet deep vertically, it has been estimated that at least seven years would be necessary to sink the shaft, and develop the mine to the point of production, no matter what the value of the deposit when proven. The expense in these cases is estimated variously from \$2,500,000 to over \$3,000,000, which contemplates the cost of sinking the shaft and opening the levels, the hoisting equipment, mills, all surface works, buildings, and other direct and general expense.



Colton Cement Works, Colton, Cal. (See page 166.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Rotary Kiln Cement Works, Colton, Cal.....	161
Colton Cement Works, Colton, Cal.....	161
Santa Rosa Stamp Mill at Santa Rosa, Mexico.....	164
La Mina Bufo, Sabuaripa District, Mexico.....	164
Chimney Constructed of Colton Cement, Los Angeles, Cal.....	166
Austin Gyratory Crusher, Used at Colton Cement Works.....	166
Buddle Floor, Cornish Tin Mine.....	167
Head Frame New Dolcoath Shaft, Cornwall, England.....	167
Loading Station on Aerial Tramway, Eastern Oregon.....	168
The Argonaut-Kennedy Case.....	169
Spraying Device.....	169
Air Blast by Injector.....	169
Mining and Metallurgical Patents.....	170
EDITORIAL:	
The Meaning of Ore.....	161
Deep Mining on the Rand.....	161
Eight Hour Bill in Arizona.....	162
Silver Coins for the Philippines.....	162
Labor Bills of Mining States.....	162
Decision in Argonaut-Kennedy Case.....	162
Labor Troubles in Mines.....	162
British Columbia Mining Legislation.....	162
MINING SUMMARY.....	171-172-173-174-175
LATEST MARKET REPORTS.....	176
MISCELLANEOUS:	
Concentrates.....	163
Hydraulic Mining in the Nome Gold Fields.....	164
Mining in Mexico.....	164
The Flashing Point of Oil.....	164
The Permanganation Process.....	166
Mine Sampling on the Main Reef.....	166
Manufacture of Portland Cement in California.....	166
Modern Mining Methods.....	166
Tin Concentration in Cornwall.....	167
The Modern Millman.....	167
Winding From Great Depths.....	168
An Aerial Tramway Installation in Eastern Oregon.....	168
The Steam Shovel.....	168
Ore Occurrence at Leadville, Colo.....	168
The Mapping of the World.....	168
An Efficient Air Blast.....	169
Efficiency of Compressed Air.....	169
Pyritic Smelting.....	169
Mining and Metallurgical Patents.....	170
Methods of Mining Coal.....	170
Personal.....	176
Recent Geological Survey Publications.....	176
Obituary.....	176
Books Received.....	176
Commercial Paragraphs.....	176
New Patents.....	176

THE Arizona Legislature has passed an eight-hour bill which applies particularly to underground mine workers. The bill as originally framed included also mill and smelter workers, but the clause affecting this class of workmen was stricken out. This bears the stamp of class legislation, and in the event of contest would probably be declared unconstitutional by the highest courts.

FOR the use of the Philippines 75,000,000 silver coins of the denomination of 1 peso will be coined. The ratio of these coins to gold will be as 2 to 1. That is, two silver pesos will have a sustained value equal to a gold dollar. The peso will contain 416 grains pure silver, while a gold peso would contain twelve and nine-tenths grains. It is thought this act, recently passed by Congress, will have a far-reaching effect in the Orient.

THE labor bills passed by the Legislatures of the several mining States making the working day eight hours for all workmen employed underground have been the cause of much comment, and are thought by many to be a species of class legislation and unconstitutional; but the Supreme Court of Colorado has decided that a law of this kind is not unconstitutional, as it might be considered as a sort of police regulation, and that labor underground in mines was calculated to be injurious to the health of the workmen, aside from its dangers, and calculated to shorten his life. An attempt was made in some States to extend the operation of the law to workmen at smelters and mills, but failed to pass. It is unlikely that the present attitude of the court would be changed in the event of legal difficulty over the enforcement of the new law.

Decision in Argonaut-Kennedy Case.

The United States Supreme Court has decided the long-continued litigation between the Argonaut M. Co. and the Kennedy M. Co. of Jackson, Cal., in favor of the former company, affirming the judgment of the Supreme Court of California. The case is a most interesting one, and involved the extralateral right question, which is such a fruitful source of litigation. These mines adjoin and are situated on an important vein locally known as the Mother Lode. Both claims were located prior to the passage of the mining laws of May 10, 1872, and patents were applied for by both companies prior to that date, though the patents did not issue until later. An important feature in the contention was the relation of end lines to extralateral right. The end lines of the Argonaut—originally the Pioneer mine—diverge in the direction of dip. For this reason the Kennedy Company claimed that the Argonaut was entitled to no extralateral right. As the claim was located under the laws of 1866, and as patent was applied for and certificate issued under those laws, the Argonaut Company insisted that as the laws of 1866 did not require parallelism of end lines as a pre-requisite to extralateral right, they were entitled to follow their vein on its dip to the extent of planes drawn vertically downward through their end lines in the direction of dip. The drawing, page 169, will serve to illustrate the situation and contention of the two companies.

The ore bodies in dispute were within the extended end lines of the Argonaut—that is, south of the north-end line of the Argonaut and underneath the Silva quartz mine, owned by the Kennedy Company. This claim was located twenty years after the entry of the Pioneer or Argonaut claim. These ore bodies were reached by the Kennedy Company through drifts run south from this south shaft sunk within the Kennedy millsite. Only a relatively small portion of the Kennedy workings were in the disputed area. The contention of the Kennedy Company was that the end lines of the Argonaut were not parallel, and consequently they were not entitled to extralateral right, and that even if the laws of 1866 did not require parallelism of end lines as a pre-requisite to extralateral right, the owners of the Argonaut mine, having accepted a patent issued after the passage of the act of May 10, 1872, which did require the parallelism of end lines, they were bound by the provisions of that law; that if, notwithstanding the non-parallelism of the Argonaut end lines, the extralateral right were not denied, such right should be defined by drawing a plane parallel with the south end of the Argonaut claim, that being the initial point of survey. The contention of the Argonaut Company was that the patent to the claim originated under the laws of 1866, and this act did not require parallelism of end lines, and furthermore that the act of 1872 granted to the owners of locations made prior to that date the right to follow their veins downward between the end line planes as they then existed. C. H. Lindley, for the Argonaut Company, claimed that if the court was to construct end lines, the end lines must be drawn perpendicular to the strike of the vein, citing as a judicial precedent the Eureka case. The application of this theory would give to the Argonaut Company all the ore bodies in dispute and more.

Judge G. W. Nicol, of Tuolumne county, Cal., tried the case and rendered judgment in favor of the Argonaut Company. An appeal was taken to the Supreme Court of California, which affirmed the decision of the lower court. The case was carried to the Supreme Court of the United States on a writ of error. A motion was made by counsel for the Argonaut Company to dismiss the writ for want of jurisdiction. The motion, and the case on its merits, were argued twice. The decision in favor of the Argonaut Company was written by Chief Justice Fuller, White and McKenna dissenting. J. Garber and J. M. Wright were counsel for the Kennedy Company.

In the course of mining operations the Kennedy Co. extracted a portion of the ore from the disputed ground, continuing until enjoined by the Argonaut Co. The injunction was obtained about eight years ago, since which time this wedge-shaped section has remained untouched by either party. In the mean-

time the Argonaut Co. have sunk a three-compartment shaft to a depth of nearly 2000 feet and have stoped ore on several levels up to the disputed line. The value of the block in question is estimated at no less than \$2,000,000, beside which the damages claimed by the Argonaut for ore already extracted seems merely nominal. The two companies agreed by stipulation that the amount of this damage—the result of two separate trespasses by the Kennedy Co.—should be \$56,099.

Labor Troubles in Mines.

As may have been anticipated, the strike difficulty at the Mountain Copper Company's works at Keswick and Kennett, Shasta county, Cal., was not permanently settled when the union men early in February were obliged to go to work with non-union men or not work at all. Their ideas and methods do not permit such a condition long to prevail. The trouble has broken out afresh and the smelter is running about one-third of its capacity, with little immediate prospect of doing better, as men are not being readily obtained to take the places of the strikers.

It is reported that delegations of strikers hoard trains going north and south in the vicinity of the mines and persuade those who have any intention of going to Keswick to offer their services, to move on and make no application for work. As a result, there are few applying at the company's office. It is asserted that unless the trouble is promptly adjusted the entire property will be closed down, and no attempt will be made to operate either mine or smelter. As before, this will mean the shutting down of several other mines in that county, which have heretofore been supplying siliceous gold ores to the smelter, thus working a great hardship on the entire mining industry in the vicinity of Keswick and throughout northern California. Manager Lewis, of the Western Federation of Miners, who was recently a visitor at Keswick in the interest of the miners, is now heard from in another locality—at the Golden Eagle mine on Hayden Hill, Lassen county, Cal., 50 miles from the nearest railroad point. Fifty men are employed at good wages and with reasonable hours for labor. If they were dissatisfied with their condition, no intimation that such is the case has been given out, but upon the advent of Manager Lewis, a union was organized and when it was considered that the organization was sufficiently strong, the demand was made that none but union men be employed.

California is not alone the scene of labor difficulties. In South Dakota, at Deadwood, the smelter crew of the Deadwood & Delaware smelter, owned by the Golden Reward Co., went on strike, it is reported, because several men who had been employed on special extra work for a few days were paid off and dismissed when their work was completed. These men were members of a union and it was decided the company could not thus summarily discharge men whose names had been entered on the pay roll. As a result, several hundred men were laid off at the mine, as with the smelter closed no ore was required at that branch of the company's works. As a further result, it is stated that the company will not reopen the smelter, but will ship the ore to Omaha for reduction. As a consequence of this strike, about 1000 men are idle.

In British Columbia there has been labor trouble for some weeks past at the several coal mines, and a shortage of coal and coke has seriously affected the metal mining industry in that province. The management of the Wellington properties has ordered a portion of their mines closed at Nanaimo, it is reported, as a retaliatory measure upon the miners, 1000 in number, for joining the Western Federation of Miners.

THE recently organized British Columbia mining association has petitioned the Provincial Government to submit mining legislation to the association for consideration before its enactment, in this manner hoping to get only such laws passed or amended as may seem of the greatest benefit to the industry. The association has also agreed to refrain from the discussion of social problems and that the organization shall be entirely non-political.

CONCENTRATES.

MINORS born in the United States are citizens and may locate mining claim. There is no requirement of the general law that the citizen shall be of any certain age.

THE mineral specimen sent from Tesla, Cal., is a piece of wood which has become silicified, and is commonly known as "petrified or opalized wood." It is abundant in the ancient river channels of California.

WHERE obtainable at a cost not lower than that of new timber and lumber, it is economy to buy remnants of timber and lumber for use as blocking in timber sets in mines. The amount of waste in framing timbers is often insufficient to supply the demand for blocks, etc., and frequently large timbers are cut for blocks only.

TELLURIDE ORES do not occur abundantly, though more common than was supposed a few years ago. In some of them the gold is not native, but a comparatively low heat usually suffices to reduce the gold to metallic form, when the rock may be "prospected" in the usual way, by crushing and washing in a pan or horn spoon.

ROCKS are not always easy of determination in the field unless one has a thorough knowledge of rock classification, and this is only obtainable by a long and systematic course in microscopic petrography and chemistry. Rocks which seem alike to the inexperienced observer may be very different in composition and origin.

COPPER AND BRASS PIPES may be bent without damage if the pipe be filled with sand. Recently coils of steel springs have been substituted for the sand with satisfactory results, but the use of the steel spiral spring requires more mechanical skill in its manipulation, and sand is usually available where suitable springs may not be.

THE principal chemicals employed in the Permanganate process are permanganate of potash and sodium chloride (common salt). The process was patented by Dr. Black about 1899, and subsequently introduced in New Zealand and Australian Colonies. It is fully described in the MINING AND SCIENTIFIC PRESS in the issues of April 6, 1901, and Feb. 28, 1903.

WHEREVER work is done by the use of heat, an amount of heat disappears equivalent to the amount of work performed; and whenever mechanical energy is spent in generating heat, the heat so generated is equivalent to the energy so spent. It is impossible for a self-acting machine, unaided by external energy, to convert heat from one body to another of a higher temperature.

TO DEODORIZE PETROLEUM mix chloride of lime with the petroleum in the proportion of 3 ounces to each gallon of petroleum; place in a cask; add muriatic acid; agitate the mixture so as to bring all the liquid into contact with the chlorine gas. Then pass the petroleum into another cask containing slaked lime, which will absorb the free chlorine and leave the petroleum deodorized and purified.

THE purple rock specimen from near Indian Guleb, Mariposa county, Cal., is pyrophyllite, a variety of foliated aluminous talc. The color is due to oxidation of iron minerals. The normal color is slightly greenish, silvery white. The radiated structure is due to crystallization. It has small commercial value, principally as hand specimens for cabinets. The black specimen is mica slate, containing crystals of chloritoid, an aluminous silicate. It is probably the result of contact metamorphism.

IT has been stated that a single leather belt, 1 inch in width and running at the rate of 800 feet per minute, will transmit 1 H. P., but authorities differ. Some say it requires a speed of 1000 feet per minute and others place it as low as 600 feet; but experiments carefully conducted indicate that 800 feet is near the proper speed. A double leather belt, at a speed of 800 feet, will transmit 1½ H. P. per inch of width of the belt, when both the driving and driven pulley are the same size and giving 180° of belt contact on each.

AN alien may make a mining location and dispose of it, providing he becomes a citizen before disposing of the mine, and the buyer, if he keeps up the monuments and performs the assessment work required by law, may acquire title to the claim. The Colorado Supreme Court has also decided that an alien upon declaring his intention to become a citizen of the United States, in the absence of any intervening rights, may have the advantage of assessment work previously done, and records previously made by him in locating a mining claim on public mineral land.

THE old screens, nails, bolts and other pieces of iron and fragments of copper plates, detonating caps, etc., recovered from stamp batteries, may be cleaned by burning the same in a furnace together with the chips of wood, consisting of pieces of wedges from the boss-heads and chips from the mine, which are removed from time

to time from the mortar, and the ashes after screening cleaned up in the clean-up barrel or pan with quicksilver. The furnaces should have a grate, but in absence of a furnace the same may be burned on the ground. In this way most of the gold may be recovered.

MAGNESITE (carbonate of magnesia) is a white, grayish-white to yellowish mineral. Hardness, 3.5 to 4.5. Usually massive, sometime fibrous, transparent to opaque. Luster vitreous. It contains, when pure, carbon dioxide 52.4% and magnesia 47.6%. Iron carbonate is often present. It is generally found in talcose schists, in serpentine, and in other magnesian rocks. It occurs in several counties of California, also at Bolton, Mass., near Baltimore, Md., Chester county, Pa., and elsewhere. It is used extensively in the manufacture of fire proofing, steam pipe covering, etc.

THE law does not recognize mining as a public utility and the right of eminent domain cannot be exercised in connection with mining operations, unless such operations are clearly a public benefit. The fact that mining in a general way is beneficial to the community and the State in which the operations are conducted is recognized, but the benefit must be of a more direct nature than this. One cannot build a pipe line or flume over the land of another without the consent of the owner, and the builder of an aerial tram may not even string a wire over the property of another, though the towers supporting the rope may be constructed on the land of the person building the tramway.

DIABASE is a coarse to fine grained, and usually compact greenish compound of plagioclase, augite, and generally viridite, with specks of ore (magnetite mostly) and accessory biotite, rhombic pyroxene, olivine and occasionally quartz. It occurs in many mining regions, and is often associated with important gold mines. The greater portion of the greenstone schists in the California gold belt are not the result of the alteration of intrusive dikes of diabase, but of sheets of ancient andesitic tuff which were deposited contemporaneously with the slates. The dikes of diabase were mostly intruded subsequent to the folding of these beds, and are usually not altered to a great extent.

CYANIDE, CYANITE AND SYENITE have nothing in common. Cyanide is the name usually given to the cyanide of potassium; cyanite, or kyanite, is a baso meta-silicate, containing alumina, silica and oxygen. A variety is found in the Cargo Muchacho mountains, San Diego county, Cal., containing lime. It is blue along the center of the crystals and whitish at the edges. It is also gray, green and black. The hardness varies from 4 to 7.25. This differs on the several faces of the crystals. It is found in gneiss and mica schist. It is sometimes associated with the occurrence of corundum. Cyanite is also called disthene. Syenite is a rock resembling granite, being, in fact, a granitoid compound of potash feldspar and hornblende (sometimes mica or augite), without quartz.

QUARTZ SCHIST is a foliated quartzite, usually with some mica, generally white. It contains a high percentage of silica, but with sufficient mica to give the foliated structure. It sometimes contains gold. Mica schist and mica slate are similar to quartz schist, but contain less silica. Mica schist contains more mica than quartz schist, and mica slate has a slaty cleavage not foliated. These latter also are known to be gold bearing in some regions, particularly in regions of old crystalline rocks, when quartz lenses and veins occur containing gold. The accompanying schists often form a zone of mineralization within which the lenses and veins of quartz occur the entire width of the zone (greatly varying and irregular in distribution of values), is gold bearing. Zones of this character usually have no defining walls.

THE term "porphyry" is the most used of any name given by miners to rocks of unknown character. They are familiar with slate, quartzite, limestone, etc., and often with greenstone as a class distinctive from the former, and call most crystalline rocks of grayish appearance and granitic habit by the general name granite, whether proper or not; but any rock of unknown character is called porphyry, particularly if it is fine-grained, more or less decayed and generally unlike the type rocks above mentioned. The term answers well enough, as a misnomer has no particular significance. Porphyry is a term describing a structural condition in rock and has no particular reference to its mineral composition, excepting as indicated by some qualifying adjective, as quartz-porphyry, meaning a fine-grained rock in which occurs crystals or blebs of quartz, also, sometimes, of feldspar (orthoclase) and mica or hornblende. Hornblende porphyry is a rock of granitic type in which hornblende occurs in prominent crystals. Feldspar porphyry is the name applied to a fine-grained grayish rock in which feldspar crystals are prominent.

RADIUM is not found in the metallic state; only its salts have been obtained from pitchblende and other uranium minerals. The chloride is the most remarkable producer of Becquerel rays yet found, its activity ranging—according to its purity—from 300 to 1,000,000 times that of uranium. The radiations are luminous, but differ from light; they affect a photographic plate, they set up phosphorescence in other substances, they burn the skin and destroy bacteria. Some of the rays are detected by a magnet and others resemble x-rays, and

change oxygen to ozone. It is estimated that 5000 tons of uranium residues would not yield two pounds of radium. In three years the production of radium salts has been only a pound and a quarter, and the only chemically pure radium chloride in existence is a specimen weighing half a grain, which the owner, Prof. Curie, says cannot be bought for \$20,000. Similar tiny specimens contaminated with barium can be had for \$5000 each, while lower grades are on the market at \$4.50 to \$100 per gram. Even if a store of radium should be found the extraction of the substance will be a great difficulty, as merely to enter a room containing two pounds would probably destroy the sight, burn off all the skin on the body, and quickly kill.

CONCERNING side-end lines, "Lindley on Mines" says, Sec. 367: "End lines are not always those which are designated as such by the locator. If the vein does not cross the line called by him an end line, it is not in law an end line. In such case it performs the mere function of a side line. In all cases where a vein crosses a side line, the side line performs the function of an end line. We call it a side-end line for descriptive purposes. Whether the side-end line performs the function of an end line for the purpose of determining the extralateral right, will depend upon circumstances. Where the vein crosses the side lines, where the crossed side lines are parallel, we do not see why the vein should not be followed on its downward course throughout its entire depth, between vertical planes drawn downward through the side-end lines, produced indefinitely in their own direction. If the side-end lines are not parallel, and the dip of the vein is toward their convergence, these lines may be extended in their own direction until they meet, and the locator may pursue the vein in depth to the vertical line of junction between the two planes. If the dip is in the direction of divergence, there would certainly be no extralateral right."

A PIPE LINE crossing a gulch or valley and conveying water from one hillside to that opposite is often called an inverted siphon. This is a misnomer, but the use of the word is generally understood. A siphon, technically, is a bent pipe having unequal branches, open at both ends, and is used to convey water from a higher to a lower level, the water passing over an intermediate point higher than the level of the water at either end. The limitations of the siphon are determined by the pressure of the atmosphere and the friction in the pipe line. The greatest height over which water can pass when employing a siphon is about 33 feet, but it is always less, owing to the conditions above stated. To make a siphon operate in draining a reservoir or mine each limb should be provided with a valve. That on the lesser end must be a short distance below the surface of the water. That on the longer end must be placed lower than the lowest point from which it is expected to raise the water. A third valve must be provided at the summit of the bend with a means for pouring water into the pipe through the valve at that point. The end valves being closed the pipe is filled at the bend. When full close the valve at this point and open the valve beneath the level of the water on the short end; then open the valve on the long end. If the air has been excluded the siphon should continue to work until the height of the column of water between the surface of water in the reservoir and the summit of the bend equals the atmospheric pressure.

QUARTZ occurs in many forms: as a granular constituent of fragmental rocks (sandstones, etc.), as a necessary component of many primary rocks, especially metamorphic schists, granite and gneiss; also in the form of crystals or blebs in many eruptive and intrusive rocks, but when a miner refers to "quartz" he usually is understood to mean that form of the mineral found as an independent rock in veins, and distinctly different from the walls of the vein. In this form it is massive, white (unless colored by mineral oxides), glassy or dull, transparent or opaque. It has great variety of appearance, but may usually be recognized by its hardness—scratches glass readily. Quartzite is composed almost wholly of quartz, but it is granular in structure, and occurs in beds. These beds may lie as originally deposited—horizontally—but may have been tilted subsequently. Most quartzite was originally sandstone which has subsequently been consolidated into a hard, compact rock by the infiltration of crystalline silica. Sometimes the grains are so fine as to be indistinguishable without the aid of a strong lens. Quartzite that has undergone this silicification sometimes resembles massive quartz to such an extent that its granular structure is only apparent under the microscope. From the above it may be concluded briefly that "quartz" is a massive form of silica and "quartzite" a granular form of the same mineral. Diabase is one of the basic rocks known more commonly as "greenstone." It is a coarse to fine-grained greenish compound of feldspar (plagioclase) and augite, with iron ore in grains (magnetite) and other less common minerals not essential to the rock. "Porphyry" is a term applied to rocks in which some mineral appears in distinct crystals, larger and more prominent than the general makeup of the mineral. This finer grained portion is referred to as the "ground mass." There are many kinds of porphyry, distinguishable by the particular mineral which appears with porphyritic structure, as "quartz porphyry," "hornblende porphyry," "feldspar porphyry," etc. Miners indiscriminately call any decomposed, eruptive rock porphyry, but the term is often misapplied.

Hydraulicking in the Nome Gold-fields.

Written for the MINING AND SCIENTIFIC PRESS by OTTO HALLA.

The first experiment in hydraulicking in the Nome region was made in the summer of 1901 by Leland, Davidson & Bliss, who had a "lay" on No. 1 and No. 2, on Snow gulch, a tributary of Glacier creek, a small ravine without sufficient water for a sluiceway, and, to be able to work it during the summer months, they resolved to get the water from the head of Glacier creek, about 5 miles distant. Work was commenced and everybody wondered if they would not lose all the water by leakage, and experienced miners advised one of the parties to the undertaking to save his money, for the reason that "the mud and moss will never hold the water." In spite of the ill forebodings the work was pushed to completion at an expense of about \$1000 per mile, and proved to be an immense success. Before the season of 1901 ended the parties had cleared above all their expenses the sum of \$50,000. This stimulated the desire on their part to extend the ditch system, if possible, and get all the water available from the Nome river. The topography of the Nome river section was favorable to the execution of this plan, and a survey revealed the fact that a ditch could be constructed to Hohson creek, where 3000 inches of water were available, to the divide between Glacier and Anvil creeks, and at the same time around King mountain to Dexter creek. This would bring the water to the most desirable section of the Nome region. Accordingly, in the fall of 1901 and summer of 1902 work was pushed on the undertaking by the Miocene Ditch Co., comprising the above-mentioned men, and a ditch constructed 27 miles in length, with a minimum capacity of 3000 inches. The work was successfully completed in the late summer of 1902, and for the first time in its history Dexter creek had enough water to be worked from the head to its confluence with Nome river. Dexter creek was a continuous street of tents, and miners were busy day and night for the last thirty days of the season. The ditch system had to embrace Anvil creek, and for this purpose a tunnel of about one-half mile length is being constructed from Snow gulch to Anvil creek, to supply that stream with water.

Meanwhile, C. D. Lane's enterprise, the pumping station, was under construction since early in 1900, to convey water in 24-inch pipes to Anvil mountain, to be used for hydraulicking Lane's claims on Anvil creek and Neckkila gulch. The plant was completed in the fall of 1902, at an expense of \$500,000 and was successfully used the balance of the season on Anvil Creek and Cooper's Gulch claims, which could not be worked previously for lack of water. Another enterprise has been commenced by C. D. Lane, on Ophir creek in the Council district. A ditch, 6 feet at the bottom, 10 feet on top and 6 feet deep, was commenced, reaching from the head of Ophir creek to his No. 15 above, a claim which has already produced more than \$750,000. This ditch is cut in rock in the canyon and only half finished. When completed it will have cost about \$250,000. The work on this ditch gave employment to about 1000 men all last summer, and will employ next season the same number of men.

The Topkock ditch was started last fall and is partly finished. It will be more than 20 miles long and will supply water to Daniels, El Dorado, Rayn and other creeks. The Solomon River ditch was surveyed last summer and work started late in the season. It will start at Big Hurrah and convey water to the Solomon river benches and reach on as far as Rock creek.

A ditch has been surveyed from the head of Nome river, taking in all the tributaries of Nome river as far as Dorothy creek, work to be commenced early next spring.

A ditch has been surveyed from Stewart creek, a tributary of Sinook, to convey water to Irish hill, on Green gulch, a tributary of Sinook river.

A pumping plant will be constructed at the mouth of Dexter creek to pump water to Dexter and Dry creeks, to compete with the Miocene Ditch Co. A ditch has been made from the mouth of Oshorn to some Nome benches about 6 miles below, and a number of other ditches have been planned all over the Nome goldfields, to be constructed at the beginning of the season of 1903.

With the return of confidence, a large amount of capital will be invested in the Nome goldfields in such improvements, and the output of gold will justify it. The area of auriferous gravel on the Seward peninsula is very extensive. It may be distributed in such quantities, however, that it would not pay to handle the ground with the old system of pick and shovel, but where a giant will do the work of 100 men the returns will be proportional.

Actual hydraulicking was done in the season of 1902 only on Snow gulch and Glacier creek, an elevator having been in use on the latter place. The success achieved and the simplicity of working has demonstrated this to be the only satisfactory method of handling this vast area of ground.

There is no doubt that many stock companies will be organized with a view of operating ditch systems

in the Nome region, and some will be legitimate operators. The majority will exist by reason of the good results obtained by the legitimate enterprises. This, however, will not in the least change the result. That hydraulicking will henceforth be the chief method in working the Nome goldfields is established.

Nome, Alaska, Dec. 10, 1902.

Mining in Mexico.

The Republic of Mexico is credited with the production of about \$3,000,000,000 in silver. So great

Statistics for 1901-02 are not yet issued, but the gold output is estimated at \$12,000,000.

Mexico as a mining field is attracting constant attention and the industry will continue to prosper and expand under modern methods.

The accompanying illustrations are of two properties in the State of Sonora, a few miles below the international boundary.

The Flashing Point of Oil.

When the vapor from illuminating or other oil is mixed with air, the mixture will not explode until the



SANTA ROSA STAMP MILL AT SANTA ROSA



LA MINA BUFO, SAHUARIPA DISTRICT

has been the output of this metal that the fact that Mexico has other mineral resources has been largely overlooked and neglected.

Official statistics recently compiled in Mexico show that the production of gold is large and on the increase. Following are the figures showing production from 1890-91 to 1900-01:

	Gold Value.
1890-91.....	\$920,702
1891-92.....	1,074,637
1892-93.....	1,269,907
1893-94.....	1,244,621
1894-95.....	4,744,542
1895-96.....	6,085,038
1896-97.....	6,861,126
1897-98.....	7,584,182
1898-99.....	9,346,541
1899-00.....	7,823,701
1900-01.....	9,327,542

proportion of vapor to air has reached a certain amount that varies with the nature of the vapor, says W. S. Franklin in his notes on "Elementary Mechanics." Thus, 1 part of acetylene to 25 parts of air is an explosive mixture, while a much larger proportion of gasoline vapor is necessary to produce an explosive mixture. Thus, the air in a vessel containing also some volatile oil, like kerosene, soon becomes saturated with the oil vapor, and, if the temperature of the mixture is slowly raised, the proportion of oil vapor increases until at a certain temperature the saturated air becomes explosive. This temperature is known as the "flashing point" of the oil. An oil to be safe for use in lamps must have a high flash point, and the law requires that the flash point of commercial kerosene shall be above a certain minimum temperature. With proper care, most anyone may determine the flash point of ordi-

nary oils. The oil to be tested should be placed in a tin vessel having a lid that fits closely but also loosely over the top of the can, and care must be taken to get no oil on the outside of the can or cover. Have a flat board handy, so that if the oil should take fire the flame can be smothered by removing the cover and placing the board close over the top. The lid for the can should have two holes, through one of which a thermometer with the scale etched directly on the glass is placed. The thermometer is used to indicate the temperature of the oil. Let us suppose that kerosene is to be tested. Fill the can about half full of the oil and slowly warm it. For this purpose an iron tripod stand and a hunsen burner turned down low is most suitable. The lowest temperature of the oil is to be observed, for which the enclosed mixture of air and vapor flashes when a lighted taper is applied to one of the holes in the lid. To determine this point for kerosene, watch the thermometer until it reaches about 50° C. or 122° F.; then apply a lighted taper at the opening in the lid. If the vapor does not flash, continue to heat it slowly until it does. Note the temperature of the oil when it flashes. Then remove the source of heat and apply the lighted taper every time the thermometer drops 5° C., or 9° F., until the flashing ceases. This gives the lowest flashing point.

The determination of the lowest temperature at which air saturated with an oil vapor will flash is a tedious operation, inasmuch as the vessel must be heated very slowly, in order that the enclosed air may be continually saturated. In commercial testing, a vessel of standard size is heated at a somewhat rapid rate by means of a lamp of standard dimensions, and the temperature of the oil at which flashing first occurs is the commercial flash point.

The Permanganation Process.

TO THE EDITOR:—In D. F. Meiklejohn's article on Dr. Black's permanganate process in the MINING AND SCIENTIFIC PRESS of Feb. 28, 1903, he compares that process with the chlorination process, rather to the detriment of the latter.

While Mr. Meiklejohn does not say so, he leaves his reader to infer that the chemicals employed cost about 30 cents per ton of tailings worked. According to my latest quotations, the supplies he uses will cost 26½ cents in San Francisco, and the freight to the Sierra Buttes mine will certainly double that, making them cost 52½ cents per ton of tailings. Then he says he extracts \$6.10 per ton and also lets the reader infer that that is 50% of their value, or they are worth \$12.20 per ton.

In August, 1898, a sample of these same tailings was sent me and they assayed \$18.60 in gold and 2.10 ounces in silver per ton. Two other sources give the same value, though I can not vouch for the accuracy of the sample. E. W. Herrin, superintendent of the chlorination works at the Gold Bank mine, Forbestown, Cal., worked these tailings in the laboratory by chlorination, and succeeded in extracting \$9.30 of the gold and 1.55 ounces of the silver. He estimated the cost of the chemicals at 35 cents per ton, based largely on the actual experience of handling eighty-five tons of chlorination tailings, which we did here at about that time. The labor would be no greater in handling the tailings for chlorination than for Mr. Meiklejohn's present practice, and the time for leaching would be very materially lessened. The extraction by chlorination shows an increase of \$3.20 over Mr. Meiklejohn's, or over 52% greater extraction. I have never failed to obtain higher results in actual practice, on a large scale, than in the laboratory. The extraction of the silver would more than pay for the chemicals used, and there is always a certain amount of gold extracted by the silver leach, hence the advantage of leaching for silver. The harrel chlorination is the method I use, the chemicals being chloride of lime and sulphuric acid. A high pressure is obtained in the harrel, which is hermetically sealed, and revolved, the revolving of the ore keeping the particles of gold bright and by constantly rubbing off the chloride of silver formed exposes clean surfaces of the gold to the action of the chlorine gas.

Certain it is that if Mr. Meiklejohn's experiments have taught him to draw the deductions he does in the beginning of his article as to the forms the gold is in in the chlorination tailings, it is a severe criticism of the men who originally did the work, and shows conclusively that they did not understand their business.

One last word in comparison of the two processes. The permanganate process was tried in Angels Camp on newly roasted ore, where the chlorination process was in operation, and the extraction was not as large as by the chlorination and the expense greater. The permanganate process was under direct supervision of Dr. Black, as I remember it. The above statement was made to me by the manager of the mine where the experiment was made and corroborated by the superintendent of the chlorination works. I have every reason to believe the process was given every show, as it was the desire of the management to lessen the cost of working the sulphurets, no matter how little. H. P. Stow.

Forbestown, March 7.

Mine Sampling on the Main Reef.*

By D. J. WILLIAMS, Johannesburg, S. A.

In sampling development drives, it is necessary first to decide upon some uniform interval between the sections; and upon the actual method of sampling the reef. We arrive at a decision upon this point by the consideration of the width and nature of the reef or leader that we have to sample. For reefs of moderate width, a section every 10 feet is generally considered sufficient; it is only in the case of very small reefs that it is thought advisable to reduce this distance; and experience shows that 5-foot intervals give satisfactory results. In the case of an extremely narrow reef, it is best to take small chips over its entire length, parcelling 5-foot lengths into separate bags.

Where the value of the reef is extremely irregular, the triangular or zig-zag method has been found to give satisfactory results. To apply this method the sample is composed, not as ordinarily of a mass of reef taken from the face at the 5 or 10-foot intervals, but of small chips taken from a zig-zag line extending across the whole 5 or 10 feet, the line of chipping being previously chalked along the reef. This method is calculated to give a fairer average sample than the intermittent method, but it is, of course, more laborious, and in some cases difficult to apply, owing to the irregular character of the rock face. In addition to the sampling of the development ground being most carefully carried out and recorded, it is undoubtedly important that notes should be kept of characteristic geological features in the mine, and of diamond drill cores, with cross-sections obtained.

A good method during development, provided the face is washed down and properly squared up, is to take small chips, in equal quantity if possible, from the whole face of the reef, having a cloth spread out to receive them. If the reef is large it should be divided up accordingly. The squaring up of the face entails some work, but if more care and time had been given to this mode of sampling in the past, much needless driving would have been avoided on many mines. Leaders have been missed in the foot, through the face not being properly squared and washed down.

Where, as is often the case, several leaders are laid bare in the side of the drive, each is sampled separately.

The practice of sampling the partings as well as the reefs, and thus obtaining the average value over the whole area, has been abandoned on the Rand. The size and weight of the samples are thus reduced, and the operation expedited. In cases, however, where the width of the reef is very small, not more, say, than 3 inches, it is advisable to include a small quantity of quartzite on either side, say 1 inch. This ensures securing all parts of the reef in the sample. The sampler, however, must be careful to include the quartzite in the measurements, and to strip the quartzite to the same depth as the reef. The latter being more friable, he is tempted to neglect this operation. It is, however, important to sample the interstratified quartzite separately at various points, especially where the line of demarcation between the true conglomerate and encasing matrix is difficult to trace. The quartzite underlying the South Reef in the Roodepoort district, that between the various leaders of the Main Reef in the Central Rand, and the quartzite and the coal seams in the Buffelsdoorn district, all carry gold. Sampling the quartzite will also help to detect any mixing of the samples underground, in the sampling room, or in the assay office, for if the quartzite is reported to carry gold in appreciable quantities, the reasons require investigation.

In sampling wide reefs, experience has shown that it is advisable to divide them up into sections. Say, for instance, we have a reef 36 inches wide, we would divide it up into three sections.

Great care should be taken if large pebbles appear in the lower portion of the reef or elsewhere within it, to sample them separately; for I have noticed often that most of the gold is located in the vicinity of these pebbles, the other portions being usually comparatively poor.

Having decided what methods to pursue, the sampler prepares for work by furnishing himself with the following equipment:

- (1) A measuring tape divided into feet, preferably 30 or 50 feet in length.
- (2) Clinometer.
- (3) Two light slide staffs.
- (4) A four-pound hammer and a stock of moils or chisels having an edge about ¼ inch wide, the ordinary sampler's pick being useless for this class of work.
- (5) A fairly large piece of cloth, or an old panning dish, which serves admirably to catch the sample.
- (6) A pot of paint of a color different from that used by the surveyor.
- (7) A strong syringe, and scrubbing brushes.
- (8) A good supply of sample bags, which should be of stout canvas, and capable of holding four or five pounds; also stock of printed labelling tags. The

utmost care should be taken to have the bags thoroughly cleaned after each handling, by being turned inside out and beaten, and an occasional wash will do them no harm. Salting is as easy with mine samples as with any other kind, and if the dust from a leader carrying ounces remains in the bottom of the bag, it is certain to influence the assay of the next sample.

To determine the positions of the sections to be taken, distances of 10 feet or less, as the case may be, are measured off with the tape, starting from some conveniently placed survey peg. The sections are marked with the paint, and every tenth section may advantageously be numbered. This enables any errors in booking the sequence of the sections to be rectified. The next step should be to wash down the sections carefully. A boy in advance with brush and syringe can keep pace with the samplers, and it will be found that careful washing saves a great deal of time. The actual chipping of the samples is not so easy as it at first appears, and at times, in very hard ground, it is very trying and requires a great deal of patience. Attention should be paid to the following points: Equal quantities must be taken from all parts of the section sampled. A sample consisting of two pounds from the lower portion and one pound from the upper portion would be worthless; for the gold is by no means evenly distributed over the thickness of the reef. Not infrequently a flake can be removed covering the whole face of the reef, and this, broken up, will be a most satisfactory sample. My opinion is that the actual size of the sample is of no consequence, provided that sufficient material can be brought up for assay, and the correct value insured. Between two and five pounds is the usual weight; others, again, believe in having big samples, even as much as ten to fifteen pounds; but with big samples it is difficult to take correct proportions. The footwall side of a drive is sampled by choice; though this is not always feasible. In sampling winzes, rises or crosscuts, the side which is most convenient and the best exposed ground is chosen. I have even sampled both sides of winzes and rises.

In drives, the reef in the footwall side at times disappears in the roof. In such cases it is necessary to sample the hanging wall side, and to make allowance for the dip when afterwards the diagrams are plotted. Again, a longitudinal fault may have thrown the reef from the footwall. If it appears on the hanging wall side, it should be sampled there, and the fact noted.

Once the sample is taken, it is of great importance that the width over which it was taken should be accurately measured, and although it may seem superfluous, I recommend the use of a couple of light slide staffs. After the reefs have been traced, both on the foot and hanging wall sides, the staffs are placed in position, and the reef carefully measured at right angles. At the same time the dip can be recorded. Samplers are too apt to place their foot rules vertically across the reef, or at times simply to guess the width.

For underground purposes two books are required, one for recording the samples, and a book of rough co-ordinate paper with squares of ½ inch for sketching the reef. When the section has been recorded in both these books, a tag, properly numbered, is placed in each bag. I find that when dealing with hundreds of samples it is advisable to have the width of reef and the date on the ticket, as it helps to trace samples in case of error.

When reproducing the sectional drawings on the surface, carefully prepared co-ordinate paper should be used, divided into eighths or tenths, and 6 or 8 inches wide. I find that the best representation is obtained, not by making all the reefs straight and parallel, as is Burnham's plan, but by using the foot of the level as a fixed horizontal datum, and setting off the heights from this. This represents more truly the actual position and shape of the reef, which is by no means a flat and even bed. Where apparent undulations in the reef are caused by the crookedness of the drive, this fact is noted on the diagram.

It is desirable to represent the value over the intended stopping width by some graphic device. Burnham uses colors for this purpose. For instance, a yellow line underneath a section denotes a value of over 20 dwts., while a red line represents between 15 dwts. and 20 dwts., etc. I find, however, that the representation is more clearly effected by erecting perpendiculars to a datum line at each section, proportional to the stopping value. A line joining these ordinates will then show at a glance what the value is at any point. Where two reefs are carried together it is advisable to represent the values separately in different colors, as well as the value of the combined leaders.

The following hints may be useful to those about to start these sectional drawings. Fixed colors should be taken for each reef, as for instance:

The Main Reef is colored green.

The Main Reef Leader is colored red.

The South Reef is colored blue.

A useful scale will be found to be 2 inches equal 10 feet horizontally, and ¼ inch equals 1 foot vertically. Sections are marked by a red vertical line at the true position to scale of the actual section sampled. These are numbered, and the distance in feet from the original shown. Should there be intervals of more

than 10 feet without samples, the tens of feet are shown but no red line or number, for these are not true sections.

A study of the cross-sections of the mine will give an idea of the distances apart at which to expect to find the payable leaders in various parts of it, and also of their dip at various depths.

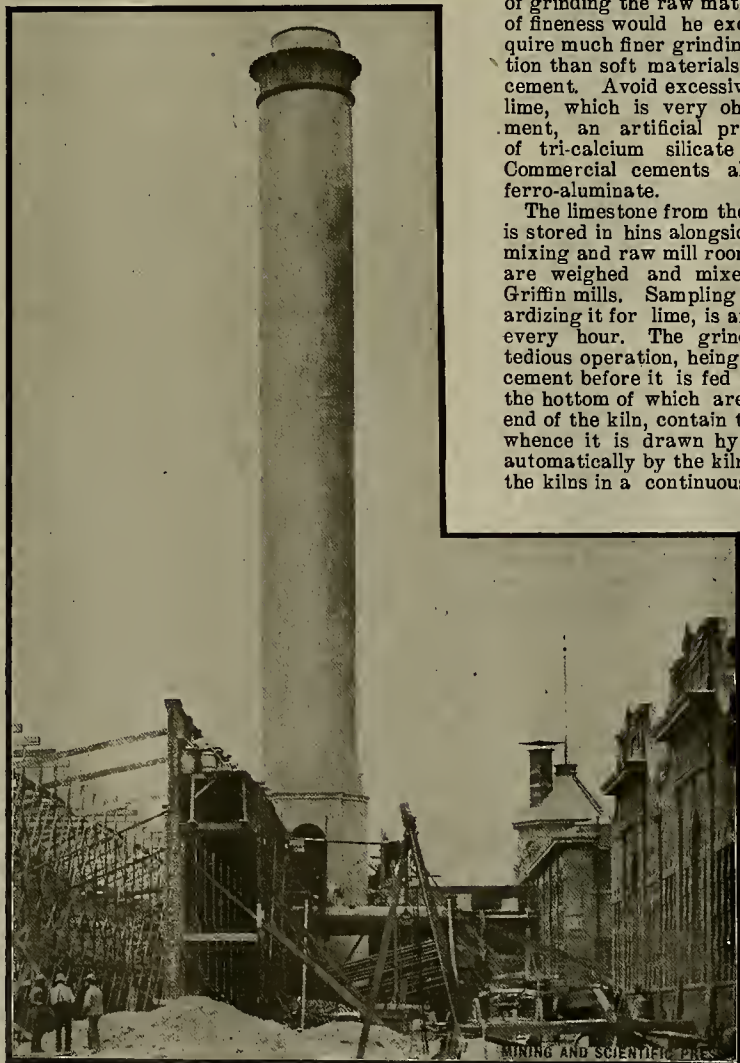
Of the landmarks which the sampler has to guide him in the Central Rand, by far the most important is the dike of igneous matter which has intruded itself between the hedding of the Main Reef Leader and the Main Reef, known as the interhedded dyke. The dyke is of variable thickness, being in some places 15 feet thick, while in others it can be traced as a thin shaly parting. It is, however, almost invariably present between the lower members of the Main Reef series, and I must say that in my experience, which is mainly of the portion of the Rand, say, between the Ferreira Deep and the Glen Deep, the interhedded dyke has not as yet failed me. I should, therefore, like to lay stress on this point, which will be a great help to samplers in the correlation of different members of the series.

Manufacture of Portland Cement in California.

Written for the MINING AND SCIENTIFIC PRESS by
O. S. BRESEE.

The works of the California Portland Cement Co. of Los Angeles, Cal., are located on the Southern Pacific and Santa Fe Railroad tracks, near Colton.

Besides the cement plant the company have a large lime burning establishment, a plaster of Paris plant, a marble dust plant, a rock crushing plant with a capacity of 750 tons daily, using a large Austin gyratory crusher, manufactured by the F. C. Austin Manufacturing Co. of Chicago, Ill., and several marble quarries, producing thirty-six different varieties of marble, which is sawed into slabs, polished and shipped all over the coast. The Rialto building



Chimney Constructed of Colton Cement, Los Angeles, Cal.

of San Francisco, Cal., is decorated with marble from the company's plant, and several other buildings of nearly as much importance could be mentioned. In fact, every possible product to be made from carbonate of lime is here manufactured, and about 140 men are employed. The capacity of the cement plant is 450 barrels of cement daily.

These works were erected in the spring of 1893

and commenced manufacturing cement under the technical direction of the present chemist, E. Dur-ye, who was one of the pioneers in this industry in the East. He was connected with the first works to manufacture Portland cement in rotary kilns by the direct process. With dry materials this was first done at Rondout, N. Y., and with wet materials at Montezuma, N. Y. Previous to its having been done by the direct method at those places the practice had been to either rekiln, make into bricks and wet, dry and regrind the materials previous to burning them in the rotary kiln. The Colton works were the second to feed the raw material directly after mixing, and grinding them together, into the kilns for burning in a continuous process.

The kilns at Colton are the longest in use in the world for this purpose, being 75 feet long, 5 feet in diameter for 55 feet of their upper length, and 6 feet in the lower 20 feet.

Calcite and clay are the raw materials used—about three parts of limestone to one part of clay make the usual proportions. Large ledges of limestone are found in Slover mountain, directly in the rear of the mill. After being quarried, it is taken in small cars through a 425-foot tunnel, crushed and dumped into a chute 2 feet high, 3 feet wide and 370 feet long, which delivers it on the highest terrace in the mill. The analysis of this rock is as follows:

Silica.....	.55
Alumina.....	.85
Carbonate of lime.....	98.60
Total.....	100.00

The purity of the rock contributing to the uniformity of the cement and its freedom from objectionable elements are the chief requirements. The clay is brought over the Southern California railroad (Santa Fe), 30 miles from Perris, Riverside county, where extensive beds of cement clay are owned by the company.

To manufacture Portland cement it is important that the raw materials should be cheap, uniform and free from large percentages of insoluble quartz sand, and also should not be hard, as in that case the cost of grinding the raw material to the requisite degree of fineness would be excessive. Hard materials require much finer grinding and more careful preparation than soft materials do in order to make good cement. Avoid excessively high percentages of free lime, which is very objectionable in Portland cement, an artificial product consisting essentially of tri-calcium silicate and di-calcium aluminate. Commercial cements always carry some calcium ferro-aluminate.

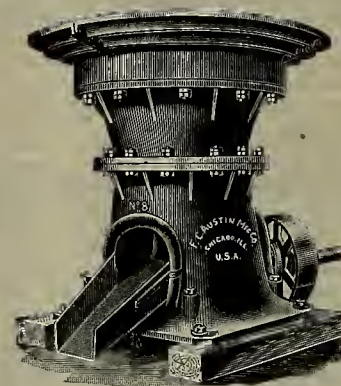
The limestone from the chute at the Colton works is stored in bins alongside of a small clay bin and the mixing and raw mill room where the rock and clay are weighed and mixed previous to grinding in Griffin mills. Sampling of the raw mix, and standardizing it for lime, is an operation necessary once every hour. The grinding of the raw mix is a tedious operation, being made as fine as the finished cement before it is fed into the kilns. Large bins, the bottom of which are on a level with the upper end of the kiln, contain the pulverized material from whence it is drawn by screw conveyors, operated automatically by the kilns at a regulated speed, into the kilns in a continuous stream. Being on an incline, the rotation of the kilns causes the material to travel slowly down the length of the kiln, which is turned completely over once every minute. The mixture is two hours in going the length of the kiln.

Petroleum is used as fuel, and is sprayed into a combustion chamber opposite the lower end of the kiln. Atomization of the oil is accomplished with an air blast from a rotary blower. About 2500° F. is maintained at the lower end and about 1200° F. at the upper end of the kiln.

Moisture leaves the raw mix first in its descent, then the carbonic acid is expelled from the limestone; when about 20 feet from the lower end, at a temperature of about 2150° F., there

is a reaction between the caustic lime, the silica, alumina and ferric oxide, by which the silicate and aluminate salts of lime are formed. A viscous condition of the materials is then produced, which agglutinates into nodules and take on a glistening appearance. High heat and fine grinding contribute to the chemical reaction necessary to the formation of cement. If the heat were not high enough a mixture of lime and burned clay would result, and if the heat were too high a vitreous slag of no strength would be formed.

If the raw mixture contains an incorrect proportion of lime, the clinker will dust or slake on cooling and exposure to the air. The burned semi-vitrified material is called clinker and falls in a continuous stream from the kilns. After cooling, this clinker is in the form of black nodules. They are hard and heavy,



Austin Gyratory Crusher, Used at Colton Cement Works.

and the sunlight striking them produces a sparkling appearance, due to the crystallization. When cold, the clinker is ground into an impalpable powder called Portland cement. About 380 pounds of cement will make a barrel of finished product and consumes 570 pounds of raw material. The Colton Portland cement has the following analysis:

Lime.....	61.512
Silica.....	22.500
Alumina and ferric oxide.....	12.400
Magnesia.....	.750
Sulphuric anhydride.....	1.200
Alkalies.....	1.500
Total.....	99.862

Modern Mining Methods.

A special report to the British Government made by the acting British Consul at Chicago, T. Erskine, a copy of which has been received by the Treasury Bureau of Statistics, entitled "Report on the Iron Ore Industry of the United States," gives especial attention to the modern methods of mining and handling ore. In mining ore in certain parts of the Lake Superior region the top covering of ground or rock is stripped off over the whole property before mining begins. Railroad tracks are then laid direct to the ore bed and the ore is loosened by blasting. Steam shovels are then brought into use and they load the ore directly upon the cars, one of these machines having loaded 170,000 tons in twenty-six days, or at the rate of over 6500 per day. These loading machines, which daily handle more than 6000 tons, are each operated by five men, and the labor cost for mining and loading averages but about 16 cents per ton, and in the case of one mine which dug and loaded 203,651 tons in 174 days, the labor cost was only 4 cents per ton.

In the transfer of ore from mine to vessel on the Lakes the absence of hand labor is also noticeable. The ore trains are run on to long docks extending high above the water and having large pockets or apartments into which the ore is discharged from the cars through an opening in the bottom of the car, from which the ore runs by gravity into the pockets beneath the tracks. From these pockets the ore is loaded into the vessel, also by gravity, and passed down long chutes into the hold of the vessel so that no hand labor is required in transferring the ore from the cars to the vessel. The ore pockets or apartments, which form a part of the dock, hold about 160 tons each, and number from 90 to 384, according to the length of the dock.

In unloading the ore from the vessels the saving of labor through the use of machinery is even more notable and important in its economies and results. A series of steel bridges, so adjusted as to be easily moved along the docks, is supplied with a hinged arm, which can be lowered to the hatch of the vessel. Along this arm and across the bridge runs a trolley train to which are attached automatic "grabs" similar to a double scoop, which are so constructed that the grab or scoop digs downward into the ore as it closes. The grab or scoop holds about five tons of ore and is described as a "digging machine," as when it begins to draw together it digs into the ore and does not depend on its weight to get hold of the ore. There are fifteen unloading machines in a battery, and the grabs run down the long arms which are lowered over each of the fourteen hatches that are in the deck of most Lake vessels carrying ore. These hatches run nearly the whole way across the decks. The grabs can thus remove over half the cargo without any assistance and the remaining half is brought directly under the hatch by use of a scraper also operated by similar machinery and managed by a man in the hold through the use of long cords. This scraper brings the ore from between the hatches so that it can be raised by the grab. These grabs are controlled by the engineer, who can drop them at any point over the hold that he

may wish, and after it seizes its load of ore it is raised at full speed, carried rapidly along the trolley to such given point as desirable, where the ore is deposited on to railroad trucks or stock piles, or in some cases into concrete troughs, through which it slides to the furnaces, where it is to be transferred into pig iron. This grab, which thus lifts five tons of ore from the vessel carrying it to such point as is desired within a limited space, has a hoisting speed of 100 feet a minute, and can run along the bridge at the rate of 1000 feet a minute. The operator travels with the grab and can unload it at any given point desired. The bridges to which these arms with their grabs are attached can be swung in any direction, so that ore, limestone or coke can be deposited or picked up anywhere in the yard, and are worked by electricity. Twenty-six men will now perform, under this system, the work for which 300 were required under the old system.

Tin Concentration in Cornwall.

Written for the MINING AND SCIENTIFIC PRESS by
C. M. MYRICK.

Any one who has had to do with mining work knows how much labor and time is expended in reinventing milling machinery along lines that have been already threshed out. The examination of old-style plants is always interesting in itself and would often prove profitable to inventors in showing what to avoid.

Tin concentration in Cornwall was developed along lines of its own that fitted the climate and the labor conditions of the country. The tin ore from the mines is crushed under gravity stamps and then the "black tin," amounting generally to about 2%, is separated by wet concentration. This "black tin" is the local name for cassiterite, an oxide which contains 78% metallic tin when pure, but as sold at the mine it runs about 70% tin.

The pulp from the battery is usually classified in some form of pointed box to get rid of the slimes and excess of water, which are led to settling tanks, while the coarse is discharged into a stationary huddle.

Usually the huddles are 18 or 20 feet in diameter and 18 inches deep, with the bottom gently sloping

for burning, while probably more than half the whole must be retreated.

The two or more grades of middlings are wheeled to the second line of buddles and dumped on the floor. Girls then slowly shovel them into a V-trough, in which jets of water are falling, to wash them into the buddle, where they are treated just like the original pulp from the battery. As before, this second oper-



Buddle Floor, Cornish Tin Mine.

ation gets rid of about one-quarter of the waste and leaves a large amount of middlings for re-treatment. These are wheeled somewhere else to be handled and rehandled, until they finally disappear, but the layman never knows just how.

In watching the operation the idea always suggests itself that there may be some particles of the ore not good enough to be saved and too good to go into the waste that have been making the rounds of the floors for an indefinite time. At some places the coarsest sands are separated, to be further pulverized either in ball mills or in grinders that resemble our grinding amalgamating pans, but not so deep, and provided with a continuous feed and discharge.

The saving of the very fine material in the slimes presents the same difficulty as in the working of sulphide ores. Many ways have been tried, but all are slow and expensive and of no very great efficiency. In the better equipped works the slimes from the battery pulp are fed on revolving huddles that work on the same general lines as the Evans table of this country. They are about 20 feet in diameter, with either a convex or concave surface, according as the slimes are fed at the center or the circumference. As the table revolves, each part of its surface is brought under jets of clear water, sometimes aided by a revolving brush that clears it of the accumulated concentrates. Usually the tailings from this treatment are settled and then retreated on "dead" frames.

These frames are very generally used and are not unlike the canvas plants now popular in California. Each frame has a sloping platform of dressed boards, about 5 feet square, over which a thin layer of slimes is allowed to flow. At one time girls swept them down with brooms at regular intervals, but latterly they were made automatic by a very simple but effective contrivance. They are generally laid down in groups of 50 or 100, and along the upper ends two launders run, one for the slimes and the other for clear water. Suitable openings in the slime launder allow for the proper feed, while from the water launder a small stream drops into a V-trough, extending across the head of each frame, and pivoted at the ends in such a way that when empty it stands upright; but when the water reaches a certain height it tips forward and discharges the water over the frame with a rush that clears it of accumulated concentrates. It then automatically returns to its upright position. This tipping trough is connected with a swinging apron extending across the lower lip of the frame, in such a way that when it tips the flow of material is momentarily diverted into a different launder from that of the tailings, so that the enriched product is led to its own settling tank.

The concentrates from this operation are not high grade and are always reconcentrated. Sometimes the frames are in tandem, the second one retreating the tailings from the first.

The capacity of these machines is very small, for at one mine, working over 250 tons of ore per day, over 500 were in use, in addition to forty revolving buddles, all working slimes.

As may be surmised, a complete plant of buddles, frames and settling tanks to handle 200 or 300 tons per day covers many acres, and is often strung out far down the drainage slope. In the older mines, especially, the works are the result of a gradual growth from small beginnings. As new methods were devised for saving a little more from the tailings, new "floors" were added below, and even when they flowed away from the company's lands leasers picked them up and saved a little more. Finally they reached the ocean, and it was found that the wash of the

waves had a concentrating effect. After a storm the heavy material is found laminated on the beach, just as black sand is found everywhere. This is scraped up, reground and concentrated and a little more tin won from it.

Not much power is required on a huddle floor besides muscular arms; but some is needed everywhere to revolve the distributors and sweeps and turn the slime huddles. To obtain this power much ingenuity is sometimes shown in utilizing the fall of pulp and wash water to operate little water wheels. One never realizes the possibilities of power transmission by line shafting until he sees the contortions of those long strings of slow-turning rods, as they extend in erratic lines from the water wheels across the buddle floors.

After the ore is concentrated until it contains 25% black tin, it is sent to the calciner, where the wet concentrates are fed on the center of a circular rotating hearth, the speed of which can be adjusted to suit the amount of burning required. Stationary plows gradually push it towards the circumference, where it is discharged into chutes that lead to the cooling floor. This burning has no effect on the refractory tin oxide, but burns any sulphides or arsenides of iron into oxides, and seems to make all the gangue material more flocculent, and so aids the final separation.

This is mostly accomplished by huddling on lines similar to the previous work, but more carefully, on account of the high value of the material. Some grades seem to separate more easily when "kieveed"—that is, one man with a wooden paddle keeps the water of a deep tub in rapid rotation, while a second shovels in pulp until the contents thicken. Then it is allowed to come to rest and is settled by striking the tub with a mallet. When the water is drained off, the lighter material is found at the top and the clean concentrates at the bottom.

The practically clean black tin from these operations is wheeled to the "tin house" and is ready for sale to the smelters. Every two weeks agents from the smelting companies visit the mines and take samples for assaying, and at a later day representatives of the mines and smelters attend a meeting known as "Tin ticketing," where bids are offered and each lot sold to the highest bidder.

At the smelting works the concentrates are mixed with fine coal and a little lime and charged into a reverberatory furnace. This is fired until the carbon reduces all the oxide to metallic tin, which is then ladled out and cast into bars for shipment.

The concentrating process, as outlined above, was universally used up to a few years ago, at which time experiments were made with the idea of introducing machinery to take the place of so much hand labor. It was then found that the pulp could be taken directly from the stamps to Frue vanners, over 90% of the tin taken out in one operation and concentrated into a product suitable for the calciners.

Moreover, the vanner concentrates contained twice the percentage of tin as the huddle product, so that the expense of calcination and subsequent treatment was cut in half.

The more progressive mines have adopted the new system and Cornwall now has some crushing and concentrating plants that are thoroughly up to date. What is locally known as the Cost Book system has had much to do in perpetuating the old methods of working. A number of men secure a working concession from the owner of the land and subscribe enough money to open the mine and erect reduction works. At regular intervals of a month or more all the stockholders meet at the company's "count house," when the mine manager reports on the condition of the mine, the tonnage worked and the expenses and proceeds. If there is a profit, it is divided up; and if the cost book shows a loss, the deficiency is made good by an assessment. No considerable capital is kept in the treasury nor attempt made to husband rich ore to carry the company over periods of scarcity; in other words, it is a question of taking the greatest possible profit to-day and letting the future take care of itself. Naturally, the tendency of this system is to discourage any large outlay of capital for expensive milling plants. After the meeting has approved the accounts, all present sit down to a substantial and sometimes protracted dinner, where the discussion of the mine's affairs is informally continued and toasts drunk to the success of the "hal" (mine).

The modern millman is the one who is awake to progress and the improvement of methods. It may be that his tailings are as low as it is business to make them; but methods may be changed sometimes to effect greater economy in working. A proper conception of the size and disposition of the working force is as important as low tailings and should receive the attention it deserves. The original design of the mill is important in this regard, as by ill-advised planning a larger force is sometimes required.



Head Frame New Dolcoath Shaft, Cornwall, England.

from the center to the circumference. In the center is a mound 5 or 6 feet across, with a slightly conical top. Pivoted in the center of this a vertical shaft revolves, carrying a pulp distributor, and four wooden arms that extend out over the buddle. These arms carry strips of cocoa matting frayed at the ends, or, sometimes, whisks of brush, that drag lightly over the sand as it accumulates in the buddle. When they are not used, it is found that a large piece of gangue and a small particle of heavy mineral will come to rest at the same point; but the gentle brushing of the sweeps helps to work the waste toward the tail. At some point of the circumference there is a sliding door, perforated with auger holes, for the escape of the water and slimes. As the buddle is filled, the foreman examines the contents and with the point of his shovel draws four or five concentric circles on the surface of the charge, their relative position depending on the richness of the mineral within each. The huddle crew then shovel the outer ring, which is mostly slime, into a launder that leads to a settling pond; the next ring is thrown into the waste launder; the intermediate rings are each shoveled into wheelbarrows and carried to other buddles for re-treatment; while the inner ring of all, containing about 25% black tin, is sent to the calciners. The total result of this first huddling is that about one-quarter of the waste has been removed from a parcel of pulp; another small part has been enriched enough

Winding From Great Depths.*

In a consideration of the Whiting system, the point that presents the most trouble to the writer is the sinking of shafts with safety and speed. The following, however, appears to be a complete solution for our particular requirements for a vertical depth of 5500 feet:

1. Adopt the system suggested by Messrs. Sederholm and Seymour, now being put into effect by the Rand Mines, Ltd., of providing temporary cylindrical drums to go down to a depth of, say, 2000 or 3000 feet. Sinking to this depth by this means is one of acknowledged safety, vide Catlin shaft—3700 feet. It has been shown that, when the reef is intersected, two sets of Whiting engines would be required—one for men and the other for ore—using the same diameter of rope. Between 2000 and 3000 feet take the cylindrical drums off the engine, use the sheave system with tailrope and establish a station at a depth of, say, 2500 feet. At this point start the second Whiting hoist on the surface, and use it simply to hoist a kibble to this established station. By this means we practically adopt a stage-winding system recommended by Mr. Behr, with the difference, however, that we use Whiting hoists instead of conical drum engines, and, when the shaft is sunk, each engine commands the total depth of the shaft without a stage.

By this system of hoisting, the reef can be reached more quickly than by any other way, and will justify the difference of cost of double attendants for shaft sinking after, say, 3000 feet. The danger of serious negative moments will be overcome by the constant length of rope always in the shaft of, say, 2500 feet, and the latter part of the sinking can, if desired, be done by making the rope taper in parallel rope sections, as recommended by Mr. Behr, from the 2500 feet to the bottom of the shaft.

Another extra safeguard that can be adopted in connection with the Whiting system, or in fact any other, is to make the rope and connections with the skip, cage or bucket with much larger factors of safety for the distance near the connection of the load and up to the hoisting drums.

2. Regarding minimum running cost, it is obvious that, for a depth of 5500 feet, it will be cheaper to keep one set of winding engines running rather than two to do the same work in two stages, and to have engines with smaller cylinders than those used with conical drums, and whose work is more uniform, and whose piston speed can with safety be greater. Tandem compound engines, suggested by Mr. Behr, are in use in the Whiting system and to better advantage than large diameter conical drums, which only use high pressure cylinders, evidently to secure safety and smoothness of running.

3. Minimum initial expenditure: Certainly the Whiting system has advantages in both size of drum, size of cylinders and weight of running parts. The price of the hoist constructed for the Rand mines is estimated erected at £13,500. The writer will leave Mr. Behr to figure out the cost on these fields of an engine similar to that designed by E. P. Allis or Nordberg at Lake Superior, and would like to see estimates for those he would recommend.

It will be noticed that, with the conical drum two-stage system recommended by Mr. Behr, some six more large conical hoisting engines would be required than with the Whiting hoists, and these hoists will certainly cost more than the Whiting engines; so it is safe to say that this method of hoisting would entail a first cost of £75,000 to £100,000 for each typical Deep Level Company, in excess of the installation of the Whiting system working only in one stage. Mr. Behr shows that, after making use of the two stages in the vertical shaft, he would still use independent hoisting arrangements underground in following the reef.

4. Flexibility: For moderate depths double drum cylindrical and double drum conical engines with hydraulic clutches, etc., might show to advantage when compared with the Whiting system; but for great depths it is seen that all the main winding engines of the world on these systems are made practically inflexible, the moving masses evidently being considered too great to be dealt with by clutches, and the Whiting system is the only one which it seems possible to render flexible for its maximum depth capacity. But it is a very vital point in this discussion, for vertical shafts, as it is seen, there is no necessity for flexibility after sinking is done, beyond taking up the stretch of the rope.

Mr. Behr can, and may, claim that he is able to construct a different type of conical drum engine than that which has ever before been in practice. This may be so, but it would be a serious and costly experiment, and he is handicapped at the start by the fact that with the taper rope system the largest diameter rope must be wound on the smallest diameter of drum. Others have striven, by the use of wrought iron, etc., to minimize the weights of the drums, and thus the moments of inertia. Even if he reaches his expectations in this respect, the Whiting system has all the important advantages of small weights of drums, moments of inertia, more uniform velocity, smaller drums and cylinders, with the pos-

sibility of using to advantage greater piston speed, and wasting less power by overcoming the momentum with the use of brakes.

It may be urged that the Whiting hoist is not as advantageous in sinking as the conical drum hoist; that in sinking it is less flexible, as the Whiting would always require the use of two skips, and, if one got out of order, work could not be continued in one compartment. This is true, if the conical system is simply for moderate depths, but for greater depths the designs of the hoist show that not only one skip could be used, and that it would always have to be run unbalanced; for, without clutching arrangements how is it possible to run unbalanced skips to advantage? There would be no provision in the one fixed drum for varying the lengths of the rope as depth was attained, and, consequently, it would take twice the running time of the engine to clear out the rock at the bottom of the shaft, than would be the case in the balanced load with two skips and the Whiting engine. This would also apply when dealing with large quantities of water. Again, the Whiting system, by its take-up arrangement composed of a sheave on a movable carriage, running on a track, and adjusted by means of a small steam winch, can use balanced skips or kibles with ease and advantage for sinking to a depth of 5500 feet, and an accident necessitates no greater stoppage than with the large conical drum system.

An Aerial Tramway Installation in Eastern Oregon.

The Hallidie-Painter Tramway Co. of San Francisco, Cal., have completed the installation of a 2500-foot aerial tramway for the Eastern Oregon M. Co. at Bourne, Baker county, Or. There are three loading stations with automatic loaders, their particular feature being that two of them load at an angle of 20° from the horizontal (one is 800 feet from the upper terminal, the other 1600 feet.) The upper of these angle stations is shown in the accompanying cut. There are seventy-two buckets, 200 pounds



Loading Station on Aerial Tramway, Eastern Oregon.

capacity each, delivering 16 tons per hour at the lower terminal. The upper terminal is the adjustable, moving terminal, because of lack of room at the lower. At the lower terminal power is generated to run a blower for the blacksmith shop.

THE steam shovel in its varied styles and types is becoming constantly a more important factor in the handling of ores and rocks in surface mining operations at mines, in railroad work and elsewhere where large amounts of material are to be speedily and cheaply handled. These devices, originally constructed with a view to economically moving sand and gravel, are now built to handle not only fine, but coarse and heavy rock masses. Some of these shovels have buckets or dippers of four cubic yards capacity, and weigh seventy-five tons.

Ore Occurrence at Leadville, Colo.

Written for the MINING AND SCIENTIFIC PRESS by
F. ROBBINS, E. M.

To understand the occurrence of ore bodies in Leadville, something should be known of the general geology of the region. Briefly stated, the geological conditions are as follows:

(1) Beginning at the bottom with the Archæan granite—the foundation as it were—in which no ore is known to occur.

(2) Following this in ascending series comes the Cambrian quartzite, in which stringers and seams of ore are found—not extensive and not profitable, so far as known.

(3) Next are the Silurian limestones. In contact between the bottom of these and the top of the Cambrian quartzite ore bodies of good size occur. In these limestones themselves, where planes of stratification are split by intrusions of porphyry, underlying the porphyry, ore bodies are found.

(4) Next is found a persistent sheet of what is locally known as the "parting quartzite." Between this and the Silurian limestone ore bodies also exist.

(5) Above the parting quartzite comes the Carboniferous (or "Blue") limestone. This is the principal ore bearing measure of the district. In it, as above, where intrusions of porphyry have found weak places and split it, occur bodies of ore.

(6) Above the "Blue" limestone comes the so-called overflow or "Block" porphyry; also a persistent sheet all over the district, but distinctly different from the intrusive porphyry which is occasional, but plays a most important part where it occurs. In contact between this overflow porphyry and the Blue limestone the principal bodies of ore of the district, perhaps, are found; at any rate, the first ore discovered were in this contact. The sheet of overflow porphyry itself contains no ore.

(7) Overlying the last described measure in many places a glacial wash is found. This contains no ore.

The usual plan of exploration consists in sinking through the wash and overflow porphyry to the first contact, i. e., that lying upon the Blue limestone. Then through the lime in search of bodies in the planes split by the intrusive porphyries, and thence down into the succession of measures and occurrences already enumerated.

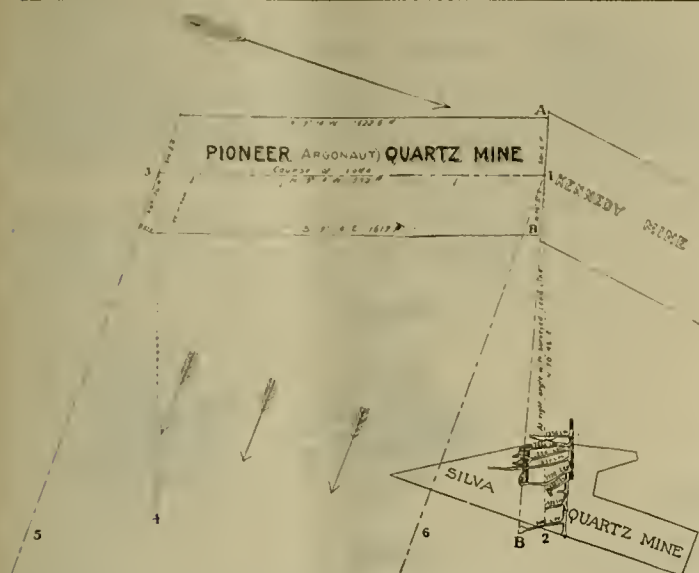
EARLY DISCOVERIES.—When the camp was first discovered there were exposed outcroppings of the overflow porphyry and the Blue limestone, with the ore lying between. This was supposed at that time to be the only ore measure. As development progressed shafts were sunk farther along the dip where there were no surface exposures of limestone, and finally some one blundered upon the lower contacts. This is the history of Leadville geology, briefly told.

The ore does not, however, occur as a measure, like a bed of coal, else it were very easy to sink and find it, but in certain channels, for illustration, like stream beds. Once in one of these channels it is easily followed, and had it not been for certain dynamic disturbances, which took place after the channels were made, it would be another simple matter to define the position of the ore. These disturbances came in the form of faults, raising or dropping great blocks of the formations, and sometimes moving them laterally as well. Hence a channel may be followed for a long distance, and then it shuts directly against a fault fissure and is for the time being lost, very much as if a horizontal seam of mortar

were followed in a stone wall until it came against a stone of the next broken course. Unfortunately the ore is not proportionately as plentiful as the mortar, but by digging about it is usually found again. This rough interpretation will hardly bear rigid scientific scrutiny, but will serve to explain the conditions to which I desire to call attention.

THE mapping of the world will be mostly an achievement of the twentieth century. The great map of the United States, begun twenty years ago, will require about a hundred years for its completion, and the chief of the Hydrographic Office reports that the 1250 chart plates in his possession represent only about one-third of what are necessary before the seas of the world will be sufficiently charted for safe navigation.

*By Hennen Jennings, from London Mining Journal (condensed).



The Argonaut-Kennedy Case. (See page 162)

An Efficient Air Blast.

Written for the MINING AND SCIENTIFIC PRESS by G. A. BIGELOW.

Having had occasion to open an old tunnel with a view of extending it, there arose a question of ventilation. Water was very scarce and no power of any kind available. The tunnel supplied from 1½ to 2 miners' inches, but this is a very small quantity apparently to ventilate 1000 feet of tunnel. The hillside dropped away on a slope of 40°, which gave ample fall for pressure, which, joined with the tunnel water, formed a problem to be solved if air was to be secured from their use. By extending the air pipe 125 feet it gave about 50 feet pressure, and having some 11 inches hydraulic pipe on hand this was used to reduce friction as much as possible in the air conduit. The pipe being kept as high as the tunnel would permit allowed clearance for moving timbers, etc., for tunnel work, and was then turned down by an elbow on the slope of the hill.

A few trees gave excellent opportunities for

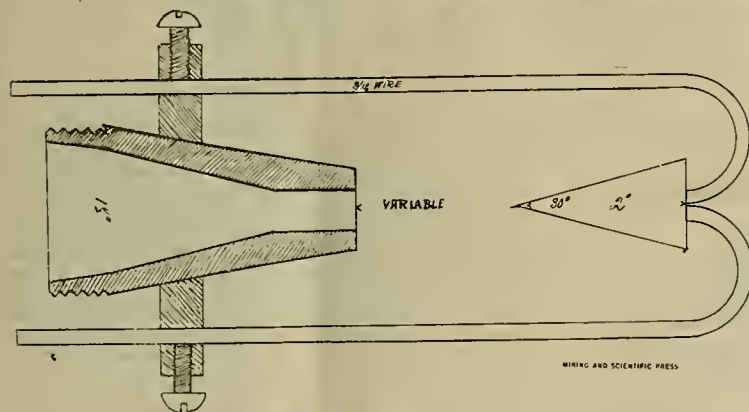


Fig. 1—Spraying Device.

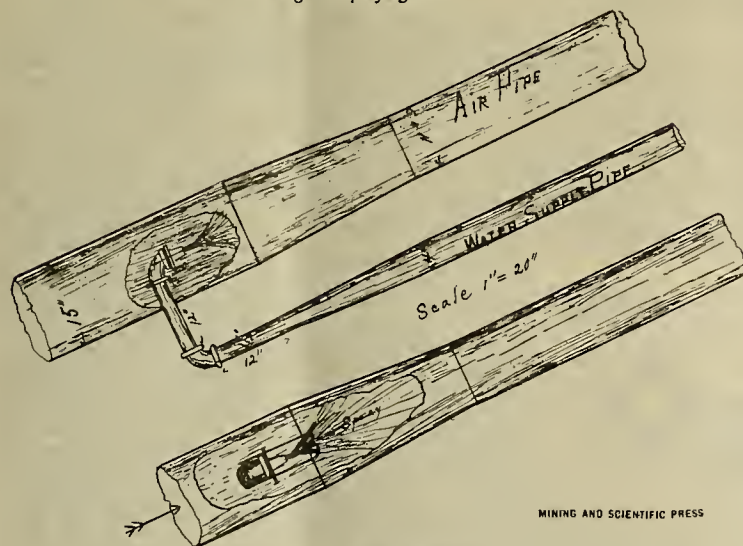


Fig. 2—Air Blast by Injector.

anchoring the pipe lines. Figures No. 1 and No. 2 give an idea of the arrangement used. Fig. 1 represents the spraying device which any blacksmith can make. A nozzle to screw into the

gas pipe fitting can be secured from any water wheel company, who always keep blank castings on hand and can be turned to suit very easily.

A larger nozzle, with one or two concentric hushings, is very convenient when the water supply is variable. The ring shrunk on the nozzle serves as a guide for the spray cone. The spray cone, made by turning a piece of copper or iron on an ordinary plumb hoh, and cast full of solder, makes a strong device, since the solder can be made to adhere to the wire guides.

The elbow screw in Fig. 2, in which the nozzle is screwed, can be turned on the pipe, making the arrangement either an exhaust or a blower at will.

Under 50-foot head, with ½-inch nozzle, using about 4 miners' inches water, a velocity of 280 feet per minute is maintained through 265 feet of 11-inch air pipe and 225 feet of 6-inch air pipe. This delivers about 55 cubic feet of air per minute.

The blast being situated on a slope, no arrangements for water escape were necessary, but in case the blast is arranged horizontal a sag of 8 inches to 10 inches can be made in the air pipe and an adjustable vent made for the water, so maintained that a little water always stands over the vent, thus preventing the air from escaping.

The diameter of the air intake pipe should be three or four times the diameter of the final delivery pipe, and is best in the form of a taper, which acts as a throat.

North Columbia, Cal., March 3.

Efficiency of Compressed Air.

In discussing compressed air, J. J. Flather in Casier's Magazine for March says:

To obtain the most satisfactory results the air must be used expansively, but usually where the demand for power is intermittent no attempt has been made to reheat the air, and as a result the combined efficiency of compressor and motor is low, varying in general from 20% to 50%. While low working pressures are more efficient than high, the use of such pressures would demand larger and heavier motors and other apparatus, which is undesirable. The advantages of higher pressures in reducing cost of transmission are also well recognized, and the present tendency is to use air at 100 to 150 pounds, instead of the 60 or 70 pounds of a few years ago.

By reheating the air to a temperature of about 300° F., which may often be accomplished at small expense, the efficiency is greatly increased—in some cases the increase has been found to be as high as 80%. While the lower pressures are yet more efficient, the loss due to higher compression is not serious.

If air be used without expansion there is a material loss in efficiency, but, on the other hand, if it be used expansively without reheating, trouble may be experienced from drop in temperature below the freezing point. With moisture present, this drop will cause the formation of ice, which may clog the passages if proper precautions are not taken to prevent it. The low temperature will not in itself cause trouble. If, therefore, the moisture which the compressed air holds in suspension be allowed to settle in a receiving tank, placed near the motor or other apparatus, and frequently drained, trouble from this cause will be largely avoided.

While it may be impracticable to reheat the air in certain cases, yet there are many situations where a study of means to overcome the losses referred to would result in marked economies.

Pyritic Smelting.*

By FRANKLIN R. CARPENTER, Ph. D.

Stripped of all fanciful claims and descriptions, this process is simply a revival of the ancient German process of raw smelting. By its means sulphide ores are treated without previous roasting as in ordinary lead and copper smelting, and the carrier of the precious metals becomes matte—usually an iron matte very low in copper instead of lead or high-grade copper matte of the ordinary process. Some copper is desirable, and when gold is present may even become necessary, but unless copper is carried by the ores treated, or handled at a profit, its use to a great extent is to be avoided, as it complicates the subsequent refining operations. From long experience, even with high grade gold ores, I concluded that copper is of less value in making clean slags than a proper observance of certain slag compositions, that are fluid and of low specific gravity, and a proper means of separating or settling the matte out of the slag.

The process is in no sense new or untried, nor in America have we really added anything new to it, not even the hot blast. Our improvements have been in the way of ease of manipulation, increased output and decreased cost.

It is unfortunate that we have confused two or three processes in the term pyritic smelting. Originally it meant only the use of iron pyrite for a carrier, instead of lead or copper matte. This is the sense in which Percy first used the term in describing the process employed at Kongsberg, Norway—Sala, Sweden—Siberia and elsewhere. No reference was had to the use of pyrite as either a fuel or a flux. Metallurgists had from time immemorial burned or roasted sulphide ores in the open air, thus losing their fuel value, before putting them into the furnace. The sole object of this was to get the iron into such condition that it could unite with and fuse and not run away from the silica, the mention of which constitutes to-day the only difficult point in pyritic smelting. After the invention of Henry Bessemer in steel converting, Halloway in England sought to apply the same principles to the Rio Tinto copper ores. He reasoned rightly enough that if the fuel value lost in burning the pyrite could be utilized in smelting it, a furnace could be driven without carbon fuel. This was clearly a different process from that described by Percy. Dr. F. L. Bartlett went to England and studied the methods of Halloway, and with more or less success applied them in Portland, Maine, where he for several years operated smelting works. Afterward came W. L. Austin with his plant at Toston, who, at first, sought only to revive the ancient process of pyritic smelting, but his later work was along lines that have been laid down by Halloway. Austin's article published in the Proceedings of the American Institute of Mining Engineers attracted instant notice. After this came Lang, following the work of Bartlett, and myself following Austin mainly, but with a knowledge of Bartlett's work and of European methods as well. A host of others came later. Many of them were metallurgists of muscular type, who brought ridicule upon the process, but others, like Robert Sticht, were of a different type, and did much to advance the subject. It is hard to define a process which runs from pure matte smelting upon one hand, where everything is prepared outside the furnace, to straight Bessemerizing upon the other, where all reaction takes place inside the furnace. The term, pyritic smelting, has come to cover every sort of precious metal smelting that is not either a distinctly copper process or a lead process. A wide variety of ores may be treated by it. They may be absolutely free from pyrite, as the siliceous gold ores of the Black Hills, where limestone is added for flux and pyrite simply for the carrier, or they may be siliceous pyritic ores like those of Gilpin county, Colorado, or Butte, Montana, or they may be exclusively pyrite, like those of Keswick, California, calling for silica. The pyrite may perform one or two or three offices. It may be added exclusively to form a carrier; it may be both a carrier and a flux; and lastly, it may become all three, carrier, flux and fuel. In the first case there is no difficulty in running the furnace. The blast is cold—carboniferous fuel and limestone or oxidized flux is added—and the muscular metallurgist shines in all his glory—for a little more flux or a little more fuel are matters of supreme indifference to him so long as the furnace does not freeze up, and usually it doesn't—while the flux and fuel last. In the second case a little more skill is required, as an excess of fuel is liable to cause a decrease of flux by reason of the pyrite melting and running away from the charge, instead of oxidizing and uniting with the silica. In this sort of intermediate pyritic smelting the blast is usually cold, and the pyrite, if a proper proportion of fuel and other flux is observed, will, in the presence of silica, break up partly and furnish the required iron oxide, as well as carrier, but there is trouble always lurking around. Sometimes all the pyrite oxidizes and no matte is formed. Sometimes it all melts, running below the tuyeres, resulting in a

* From Bulletin Colorado School of Mines, condensed.

frozen furnace in spite of every care, including the foreman's cure-all of "more coke." In the third example it is absolutely necessary to have a hot blast. The best examples are the methods of Robert Sticht, South Australia, and Wright of Keswick, California. At the last place it is claimed that as high a grade of matte is now made with the use of the hot blast and low coke as was formerly made when the ore was roasted and the ordinary methods of matte smelting employed.

The cost of smelting in these three examples, labor and supplies being the same, decreases as the amount of pyrite increases. It will be readily seen that extraneous fuel and flux cost money, and so far as they can be reduced, just so far will the cost of smelting decrease. The Deadwood plant is an example of the first kind. The ores which bear the cost of smelting are all siliceous, averaging 76% silica, 12% to 20% FeO, with small quantities of lime, magnesia and alumina. The pyritic material used was formerly, and is again lately absolutely barren of gold, silver and copper. For awhile the Homestake concentrates were employed, which gave rise to an excessive amount of flue dust, which was resmelted in reverberatories, and the resulting matte added to the ore charge, so that they were finally forced through the furnace; but their use is now abandoned. The coke was always poor. The charge consisted of equal quantities of siliceous ore and dolomitic limestone, with sufficient barren pyrite ores and copper ores to form matte. The cost of smelting per ton of siliceous ore was never below \$6.50. This included coke, limestone, coal for reverberatories and boilers, labor, barren pyrite, matte treatment, copper ores handled at a loss, supplies, assay office expenses, general office expenses, salaries, etc.

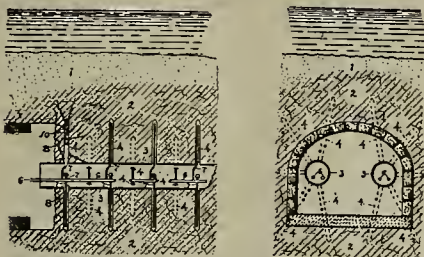
(TO BE CONTINUED.)

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 3, 1903.

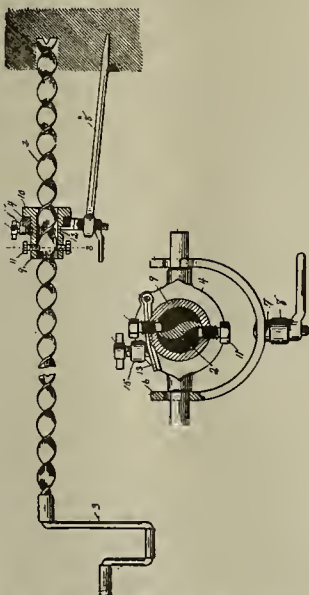
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METHOD OF FREEZING THE GROUND AND EXCAVATING OR TUNNELING.—No. 721,830; C. P. Perin, New York, N. Y.



Method of excavating which consists in, first, constructing pilot tunnel in advance of main excavation; second, extending radially therefrom plurality of cells; third, circulating therein freezing agents; fourth, inserting therein means for disintegrating surrounding material; fifth, disintegrating surrounding material; sixth, removing disintegrated material.

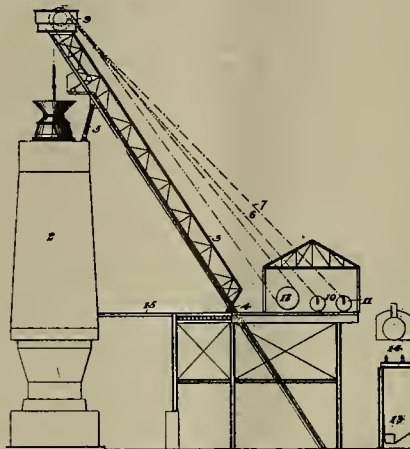
COAL OR ROCK DRILL.—No. 721,895; L. K. Koontz, Allegheny, Pa.



Combination of bearing head having circular opening, sleeve of greater length than head and mounted between its ends to rotate in head, annular enlargement.

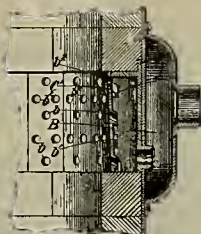
ment at one end of sleeve adapted to bear against one face of head, friction device secured to opposite face of head, projecting portion of sleeve being formed with annular depression which receives friction device, thereby confining sleeve against longitudinal movement, means for adjusting device, and drill extending through sleeve and operatively engaging same.

BLAST FURNACE.—No. 721,956; C. W. A. Koelbeck, Cleveland, Ohio.



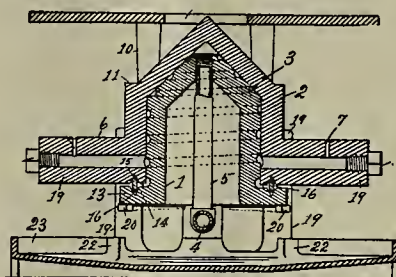
The combination with blast furnace, of inclined bridge leading to its top and loose connection between bridge and top arranged to allow movement of one relatively to that of other and having pivotal link connection with furnace top, and skip movable along track supported upon bridge.

TUYERE FOR CUPOLA FURNACES.—No. 722,062; S. Watt, Barnesville, Ohio.



A tuyere for cupola furnace, comprising open front casting, removable front plate, interlocking lugs on casting and front plate for securing latter to former, with jet apertures permitting the front plate to be removed when forced upwardly.

HYDROCARBON BURNER.—No. 722,155; H. L. Sherwood, Oakland, Cal.



In oil burner combination of suitable base, upper and lower detachable sections resting on base, each having upwardly pointed conical portion, portions fitting one within the other and provided with means for forming spiral conduit between two portions, nozzle extending from one of sections and connected with lower portion of conduit, oil supply pipe connected with upper portion of conduit, means for making gas-tight joint between two sections, spreader supported upon burner and having wing arranged to be impinged upon by flames from nozzle.

CONVEYOR BELT.—No. 722,041; G. C. Plummer, Philadelphia, Pa.

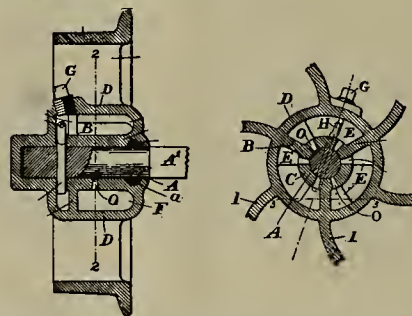


Conveyor belt, having central firm and unyielding body and flexible webs along side edges thereof, belt being made up of series of plies of canvas connected by longitudinal rows of stitches, stitches in body extending through all of plies thereof, and portion of stitches in webs extending through two or more of outer plies only, body being saturated with drying, hardening composition, and webs being saturated with non-drying composition.

METHOD OF CONVERTING MATTES.—No. 722,198; R. Baggaley, Pittsburg, Pa.

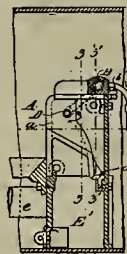
Method of converting copper which consists in supplying air blast beneath surface of bath, and applying extraneous heat of flame to surface near end of converting operation, and maintaining thereby temperature of bath sufficiently high to prevent formation of copper noses.

SELF-OILING WHEEL.—No. 722,044; E. Ramsay, Birmingham, Ala.



In self-oiling wheel, combination with fixed axle, of wheel having hub formed of inner and outer webs providing annular space between them, longitudinal ribs dividing space into oil chambers and terminating near one extremity of space, lateral ribs extending from each side of ribs and constituting with longitudinal ribs oil receptacles communicating with space between adjacent ends of lateral ribs, linchpin passing through axle in space for holding wheel thereto, inner web of hub extending beyond linchpin and having closed end integral therewith against which end of axle is adapted to abut, there being oil holes in inner web adjacent to longitudinal ribs for feeding oil to axle, and oil supply communicating with linchpin space.

SMOKE CONSUMING APPARATUS FOR FURNACES.—No. 721,652; J. Alves, London, England.



In smoke consuming apparatus for steam boiler and other furnaces wherein heated air, under influence of steam jets, is supplied to furnace, bridge A, walls therein dividing bridge and constituting passages a' for incoming air and alternating passages a for heated air, steam superheater B secured to upper side of bridge, steam jet pipe D traversing passages a', a, and in communication with superheater B, and chamber E', at rear of bridge, into which passages a' open, latter serving to conduct and heat air prior to being impelled through alternating passages a under influence of steam jets into furnace.

Methods of Mining Coal.

Coal mining differs somewhat from metal mining in numerous important particulars. The methods generally employed are briefly described by J. F. Kemp, in Bulletin No. 1 of the Engineering Company of America, as follows:

"The simplest methods are by open cuts. Along the outcrop of the thick seams, especially where the dip is flat, the over-burden may be removed within allowable limits of cost and the coal may then be quarried out. The day is rapidly passing for this method. In underground work it is important to ground the shaft at the lowest point of the coal within the tract tributary to it. The coal will then roll down to the hoist. As nearly as possible the ground is blocked out with gangways which run in parallel pairs, so that fresh air may travel out one and return on the other. Chambers are then turned up-grade from the drifts, and as a rule are made about 30 feet wide. Ordinarily they are driven 300 feet and stop just short of the next pair of drifts. Where the grade is flat the cars are hauled up to the breasts, but as the grade increases this becomes impracticable. The coal may then be run down in small 'buggies' to the main drift, or as the inclination becomes greater, be allowed to slide down on sheet iron, or with the steepest dips be allowed to slide on the rock-floor itself. In the opening of an anthracite colliery the sinking of the shaft, the driving of the air and haulage drifts, the blocking out the chambers and the installation of the breaker and other surface works involve heavy initial outlay. The expense of installation is much greater than is the case with bituminous coal."

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence).—In the Nome field the most new work is being done in the neighborhood of Peluk, Martin's creek and Otter creek. More than a dozen steam thawers are at work on the creeks, which are situated about 2 miles east of Nome, and some very good prospects are being found. The Kougrook section, especially Dabi creek, is very much talked about at present; pans running as high as \$30 are sometimes taken out. Nevertheless, old prospectors of the Kougrook maintain this to be "only a small spot and will not last; they may work for 1/2 mile and find nothing after this spot is worked out."

The Inmatebuk river and Old Glory are being well spoken of and quite a number of stamperders went into that section to relocate ground. Gold Run benches are being prospected with very good results. Some parties (G. Selfert and associates) have done work on the benches late this fall and struck the pay channel. They had taken out \$14,000 with six men in ten days before the ground froze.

Coal is still maintained at \$35 per ton, although there seems to be a large supply on hand. The extortionate price is to be regretted, as it keeps many from working their claims. The price of bread was raised from 5 cents to 10 cents, but otherwise provisions are reasonable, with the exception of eggs, which sell at \$22 50 per case. Potatoes are \$5 per crate, fresh meats (frozen) 20 cents to 35 cents per pound, coal oil \$1 per case.

Nome, Dec. 12, 1902.

J. L. Parks, operating on Candle creek, reports to the Nome Gold Digger of much work being done this winter around Candle. Coal sells at \$2 per sack on the creek, but many of the miners are hauling their own coal from the ledge on Chicago creek, a tributary of Kougarok, 20 miles from Candle. The trail to the mines is good and with a good dog team they haul 1000 pounds per load. He says there are several steam thawers in operation in the district.

The Miocene Ditch Co.'s tunnel through the divide between Anvil creek and Snow gulch, near Nome, is being driven ahead at the rate of 2 feet per shift, with two shifts at work on both ends. It will be 1850 feet long and is 4x6 1/2 feet, the depth from the summit of the divide to the bottom of the tunnel being 100 feet. The Snow gulch end is in 860 feet and the Anvil end 560 feet. They expect to have the water turned in by June 1. The ditch on the Snow gulch side was cut last summer. The water is brought down to the divide near the head of Anvil and Glacier, from Hobson creek. Here the ditch forks, one fork going to Dexter, the other running along the left limit of Glacier to the tunnel at the head of Snow gulch. After passing through the tunnel it will be taken up Anvil on the right limit, thence around Anvil mountain to the head of Copper gulch. They will also supply Bourhon, Newton and smaller gulches, as well as all the claims on the benches and tundra below.

Speaking of the work around Anvil creek, the Nome Gold Digger says that near the head of Nicola gulch, on the Wild Goose Co.'s Lena claim, there is a steam hoist working the shaft 120 feet deep and fifteen men are at work. On the Snow Flake claim of the Beau Mercantile Co. they are drifting on the 130-foot level and have twenty men at work. Over the divide on the Dexter side, near the head of Grass gulch, Kelly & Co. have a steam hoist at work and are down 70 feet and drifting. There are several parties working quartz ledges on the right limit of Anvil.

The Olympia M. Co., operating on Woe-wodski Island, which lies near the North Wrangell Narrows, is working fifty men, says Superintendent E. E. Harvey. They are blocking out ore and it is proposed to install a mill in the spring.

Native platinum is reported found in the sluice boxes on Slate creek, 140 miles up the Copper river from Valdez.

Twenty wells will be drilled between June 1 and December 1 at Cook's Inlet by the English Co. which brought in a flowing well last year at a depth of 360 feet.

President W. Ebner of the Ebner G. M. Co., operating at Silver Bow Basin, on the mainland north of and opposite to Douglas Island, near Juneau, says they will add 100 stamps to their mill this year. They own eight claims, and the mine has been developed by a tunnel 900 feet long, giving a depth of 600 feet on the main ledge, which is 40 feet wide, of low-grade ore. They have air compressors, machine drills and a 15-stamp mill in oper-

ation, being worked by water power. The ore is free milling.

ARIZONA.

COCHISE COUNTY.

The El Capitan M. Co., working a group of claims near Walnut gulch, has bought a half interest in the J. W. Brown group of five lead claims, 18 miles north from Tombstone, in the north end of the Mule mountains, says Manager A. Grator.

The Dos Cabezas G. M. Co. expects to have its plant, near Dos Cabezas, in the Dos Cabezas mountains, in operation by April 1st, says the Review. Delay has been caused by the non-arrival of machinery.

COCONINO COUNTY.

The Malachite Copper Co., says Superintendent M. J. Runneville, has begun work this week on their group north of Williams.

GILA COUNTY.

A strike of ore has been made in the Alice mine of the Troy-Manhattan C. Co., near Globe, says the Silver Belt. On the 400-foot level, in a drift run in the contact, and at 140 feet from the shaft, 9 feet of black sulphurates were cut which assay \$17 in gold and 15% copper. They have drifted on this body of ore for 30 feet. On the Manhattan side the ores show values in gold.

GRAHAM COUNTY.

Superintendent Crowley, of the Antietam mine, near Clifton, says the crosscut from the shaft has been run 40 feet, 20 feet of which is in smelting grade copper ore.

The Polaris Co. last week took up its option on the Evans Point millsite, near Clifton, which includes the 20-stamp mill and pumping plant, and several buildings.

MARICOPA COUNTY.

J. B. Barnett, D. A. Murphy, J. B. Forbes and H. J. O'Brien of Kansas City have bought the Humphrey group of twenty-five claims, 3 miles east of Morris-town.

Manager Witherlay, of the Socorro mine, near Wickenburg, says the mill is in operation and the cyanide plant will be completed next week. They have 100 men at work.

MOHAVE COUNTY.

The Elkhart mine, near Chloride, is shipping seven carloads of concentrates per week from the mill, says Superintendent Barmora.

H. N. Botsford, superintendent of the Tennessee mine, near Chloride, says the company will resume operations at the mine on the 15th inst. The main shaft will be sunk several hundred feet deeper.

The Mohave County Miner says Hayden, Stone & Co., of New York, have bought the Sheeptrail group, near Kingman. The property consists of the Sheeptrail mines, 20-stamp mill, hoisting and air compressor plants.

Lumber and machinery are on the ground for the mill of the Mohave G. M. Co., near Spear's lake near Kingman. The mill will have forty stamps and will handle 120 tons daily.

PIMA COUNTY.

A. H. Emanuel has been appointed receiver for the Copper Belle M. Co., near Tucson, which was declared bankrupt by the court last week, says the Review.

Last week fifty mineral locations were filed on claims near Douglas, says the Review. Several parties found quartz at the foot of Nigger Head assaying \$10 in gold, 4 1/2% copper and 10% lead.

Men are at work on the Yellow Jacket mine, near Tucson. The water is being pumped out. The Old Glory mine has been bonded to Baker & Co. of Michigan, and operations begun. Work has started on the Yellowstone group, owned by H. F. Diehl, and adjoining the Oro Blanco mines near Tucson. The Sierra M. & M. Co. are opening up their lead-silver mines in the Sierrita mountains, near Tucson.

PINAL COUNTY.

Foreman Wilson of the Copper Buttes mine, near Florence, says he has struck a body of iron ore in the tunnel he is driving on the main ore body and that this iron ore carries values in gold.

A bond has been given on the Box Canyon gold mines to Carr, Provand and Cope. One of these claims has been prospected to a depth of 100 feet by two shafts sunk on the vein and connected at the bottom by a 150-foot drift. The ore, it is said, can be treated by cyanide. The group is 18 miles northeast of Florence, in the Mineral Hill district.

A. M. Womble of San Francisco, Cal., is examining the ore outlook around Tucson, with the intention of establishing a smelter and reduction works, says the Tucson Star.

YAVAPAI COUNTY.

At the Monica mine, in Weaver district,

near Prescott, an 8-foot ledge of free-milling gold ore assaying \$10, with some silver, has been cut. The owners—T. Ernhart, E. B. Corbell and F. E. Howe—propose to install a stamp mill and other machinery.

It is reported a body of ore has been struck in the Boggs mine, near Prescott, which carries one ounce gold per ton, ten ounces silver and 4% copper.

G. W. Hull says he has men drifting both ways on the ore body struck in the Dillon tunnel, near Prescott, and that they are taking out ore for shipment.

Superintendent Pickrell, of the Gold & Copper Con. M. Co., says their quartz mill and cyanide plant, at their President group of mines in Hassayampa district, near Prescott, are in operation.

F. Giroux and I. Salinger, operating the Victor mine, near Walker, will put in a mill of forty tons daily capacity, in addition to the one now in operation.

Superintendent Simington, of the Grand View group on Cherry creek, near Prescott, says he had a test run of their ore made last week through the quartz mill of the Monarch Co. which returned \$7 free gold; the concentrates assaying \$62 gold, \$1.90 silver. The principal development work on the Grand View group has been done on the Rattlesnake, the central claim of the group, which has a shaft down 170 feet and a drift from the 100-foot level 100 feet in.

CALIFORNIA.

AMADOR COUNTY.

The long-pending suit between the Argonaut M. Co. and the Kennedy M. Co., at Jackson, has at last ended, the Supreme Court of the United States having rendered a verdict in favor of the Argonaut M. Co. (plaintiff). The Argonaut, which has been worked only intermittently for a year or more, will now begin active operation on the block of ore so long in dispute.

Sinking the main shaft at the Oneida mine, near Jackson, is down 2200 feet, and it is the intention to sink to the 2500-foot level, says the Dispatch.

Operations at the Sargent mine, near Jackson, have stopped for the time being.

At the Kennedy mine, near Jackson, 20 stamps of the new mill are ready for operation and the concentrators are being set up. It is the intention to run the mill by electric power. It is proposed to start these 20 stamps as soon as possible, in connection with the present hoist. The new hoist will be ready by May 1st. It is of 1000 H. P., and has capacity of hoisting 10.0 tons of rock per 24 hours, hoisting 3 tons per load. J. F. Parks is superintendent.

CALAVERAS COUNTY.

A dredger is to be put in on the Calaveras river near Jenny Lind, by W. H. Hammond & Co. of Oroville.

At the Duchess mine, situated above Parrott Ferry on the Stanislaus river, near Vallecito, a wire rope tramway has been installed to transport ore from the tunnel to the mill.

The Angels Record says the 60-stamp mill at the Utica mine at Angels is soon to be taken down and added to the Stickle mill of the same company. The oil tank at the chlorination works is completed and the burners are being put in and pipe connections made with the furnaces.

The Nelson Contracting Co., operating the hydraulic mines at Calaveritas, made a partial cleanup last week with satisfactory results, says Manager Nelson.

Last week the Fanny Marie Co. began work on the C. A. Berry mine at Glencoe.

FRESNO COUNTY.

The Home Oil Co. at Oil City, near Coalinga, has had its wells cleaned out and put under the pump.

INYO COUNTY.

A. A. Casler has bought the Gold Bug, Golden Reef, Hardscrabble, Indian Queen, Eclipse, Ophir and Rustler claims at Fish Springs.

The International Equipment Co. of Los Angeles have bought the Ratcliffe mine, near Ballarat, and will equip it with new machinery.

KERN COUNTY.

The Breadwinner M. Co. of Los Angeles, owning the Cowboy mine near Caliente, are arranging for a 40-stamp mill.

The Big Blue M. Co. at Havilah have found steam more expensive than their water power, and are going to re-establish their water power plant, says the Randsburg Miner.

Another Sunset producer was brought in last week by the Shafter well, east of the Queen, and while the casing is being sunk deeper into the oil sands the well is flowing at the rate of 200 barrels per day.

The St. Paul & Sunset Oil Co. will build a 100,000-barrel reservoir in Sunset and sink more wells.

The California Con. Oil Fields Co., or-

ganized under the laws of Maine to control the output and business of the Sunset and Midway fields, filed its papers with the county clerk last week. The following are directors: S. Jewett and H. A. Blodgett of Bakersfield, E. W. Guptill, L. L. Light, H. P. Sweetser of Portland, Me.

The Silver Star, a San Francisco company, has struck oil in its first well at McKittrick, says the Californian.

The Southwestern Refinery Co. is pushing work on its refinery at Kern river, near Bakersfield. Material for the stills and machinery is on the ground. The capacity of the refinery will be 12.0 barrels a day.

The Friday mine, at Havilah, is reported to have produced over \$200,000 down to the 125-foot level, where water was encountered. Since then the shaft has been retimbered from top to bottom; a steam hoist, a new 25 H. P. hoisting engine, a 30 H. P. boiler and a pumping plant have been installed. The shaft will be sunk several hundred feet; J. Hayes, superintendent.

The 300-mile pipe line constructed by the Standard Oil Co. from Bakersfield to Point Richmond (Contra Costa county), on San Francisco bay, is completed. It is expected they will be pumping oil from the Kern county fields by April 1st. The first tests of the line were begun this week at the Kern river end. The test is by water forced through the pipes at 100 pounds pressure per square inch. The line is divided into ten sections, with a pumping station every 28 miles. The speed at which the oil can be moved will not be determined except by actual transportation in the regular order of business. The oil is very thick, but heating it is expected to permit it to run readily after it is set in motion by the pumps. The pipe line will insure a supply of crude oil at the refining plant of the Standard Oil Co. at Point Richmond.

LASSEN COUNTY.

Some of the miners at the Golden Eagle mine, on Hayden Hill, having organized a union, have demanded that the company employ union men only, and, not meeting with a prompt affirmative response, went on strike.

LOS ANGELES COUNTY.

The 2-stamp mill of the Mesquite Ore and Reduction Works, Mission road, East Los Angeles, began operations last week. It has a capacity of 8 tons daily. The Mesquite Co.'s claims are in San Diego county. The capacity of the plant will be increased as soon as the development work opens up more ore.

MONO COUNTY.

The mill at the Lydia mine, near Benton, has been closed down temporarily owing to the freezing of water pipes.

H. W. Nelson, superintendent of the Copper Mountain mine and reduction works on the shore of Mono lake, 5 miles from Lundy, says work is temporarily suspended on account of severe weather.

NEVADA COUNTY.

The Oakland mine (formerly known as the Golden Gate), on Rattlesnake ravine, 5 miles from Grass Valley, will be reopened, says J. V. Bennetts, the principal owner.

PLACER COUNTY.

The Enterprise mine at Iowa Hill is being prospected by Gilmore Bros. The tunnel is in 400 feet and paying moderate wages to the men who are working, says the Sentinel.

V. C. Gorst, who has a lease on the Green Emigrant, on the Pike Bell place, in Rock Creek, near Auburn, report taking out \$600 in two pans, down 30 feet last week.

PLUMAS COUNTY.

It is reported the Standart & McGill mine near Greenville, and owned by Eastern men, will begin operations by April 1st.

SACRAMENTO COUNTY.

The Boulder M. Co. has begun operations on Carson creek, near Folsom, with G. Bigger as superintendent.

The Sacramento & Rescue M. Co. is operating its mines on the Hale group, near Folsom.

SISKIYOU COUNTY.

J. Grayson, owning the Punch Creek quartz mine on Humboldt creek, near Hawkinsville, is putting up a water wheel for power to run pumping machinery in order to sink shaft deeper. A 10 stamp mill will be installed this spring and will be operated by power from the Siskiyou Electric Power Co.

Coal is being taken out at the coal mine on the Herr ranch between Yreka and Ager, and they are down 800 feet. During the coming summer arrangements will be made for shipments.

J. McKeen, superintendent of the McKeen mine, near Etna, says their machinery plant is in operation and has men

working in Nos. 1, 2 and 3 tunnels driving on the ledge. The mill will be started up this week. The cyanide plant was enlarged last summer, giving a capacity of seventy tons of ore daily.

At Oro Fino last week Chaplain & Picard bought the Old Dan Manning quartz mine for \$1500, and will begin development work next spring.

The Schroeder mine at Deadwood, Superintendent McLean, and the Rusby, Superintendent Connors, are doing development work.

Superintendent Phillips of the McKinley mine at Deadwood, says he will build an arrastra as soon as weather conditions are favorable.

The Brokaw mine at Greenview has closed down for the season, says the Farmer and Miner, and heavier pumps will be put in in the summer.

The Jilson quartz mine, near Henley, is being worked with thirty-five men, and the mill will be started up next week, which will require additional miners.

Work has started at the New York mine on Indian creek, near Yreka, says the Journal.

W. Lindsay of Portland, Or., has men at work on the Finley & Johnson mine, on Russian creek, near Etna.

TRINITY COUNTY.

J. J. Chambers of Redding has an option on the Lappin group of mines near Deadwood and will begin work this month. Machinery will be put in and a tunnel run to cut the ledge at depth and drain the mine. From 250 tons of ore from the Lappin crushed in the Brown Bear mill last summer \$8200 was netted.

TUOLUMNE COUNTY.

(Special Correspondence).—Owing to late developments in the App mine at Quartz, W. A. Nevills says he will add forty stamps to the mill. Large ore bodies have been cut on the 1100 level, in the east or hanging wall schists of what is generally considered the mother lode or ankerite vein.

The Campo Seco shaft is down 110 feet and sinking with two shifts. The bottom of the shaft is in quartz carrying auriferous iron sulphides. At 150 feet a second level will be opened, when, if developments are satisfactory, a mill will be built. J. H. Hall is superintendent.

On Nigger hill Superintendent Pinney is sinking the shaft recently reopened. The surface of this hill has a score or more of shafts, tunnels and pits made by pocket hunters, with the result of the finding of several thousand dollars in gold. The present is the first attempt to systematically develop the property. Sinking is being done by means of a windlass, but a hoist is to be put in.

The Harvard is running steadily, operating only the south shaft.

W. A. Nevills says that chlorination at the Rawhide is to be discontinued in favor of the cyanide process, as by the former the cost is from \$7 to \$9 per ton of sulphides treated. Experiments have demonstrated that by finer crushing a high extraction can be effected by means of the cyanide process at a cost of about \$2 per ton.

Jamestown, March 10.

The Keltz mine, near Columbia, has closed down, says the Magnet.

At the Mazeppa mine, at Stent, operations were closed down last week, says the Magnet, pending the addition of ten stamps to its mill.

A Cornish pump has been put in at the Draper mine, near Soulsbyville.

A new furnace is being built at the Shawmut chlorination plant, near Chinese, says Superintendent C. L. Uren.

Superintendent Morrison has resumed at the Crystalline and development work will be increased. The mill is in operation.

Manager M. B. Kerr of the Jumper Mine Syndicate, at Stent, says other operations are suspended while the stopes which recently caved are being filled and caught up. The 500-foot level drift is within 200 feet of the Golden Rule, and when connection is made the Golden Rule rock will be run through the Jumper mill. He expects to resume full handed April 1st.

The Ellen Winton Extension mine, near Groveland, has been sold to the Ellen Winton G. M. Co.

W. H. Dennis has bought a quarter interest in the Ballarat quartz mine, 1 mile east of Columbia.

Superintendent Van Syckle has men at work reopening the Mayflower mine near Carters. There is a 2-stamp mill on the mine.

The Puerto Fino mine, near Carters, will reopen May 1st, says the New Era.

At the Mt. Jefferson mine, near Groveland, the shaft reached the 500-foot point last week; a station has been cut and drifting begun.

After a temporary shut-down the mill on the Star mine, east of Columbia, was started up last week.

Fifty men are on the pay-roll at the

Densmore mine, near Columbla. The 10-stamp mill and the 2-stamp batteries are in operation.

The Punter mine, near Sonora, under bond to H. J. Dykes, has been equipped with boiler and pumping machinery, and operations will begin next week.

Operations in the Mazeppa mine, at Stent, ceased last week pending the addition of ten stamps to the mill.

COLORADO.

BOULDER COUNTY.

At Rowena the Prussian mill is in operation after being enlarged, using the process of the National Automatic Furnace M. & M. Co., which consists essentially of roasting and cyaniding, says the Gazette.

Drills, air compressor and other machinery have been added to the equipment at the Graphic mine at Magnolia.

CHAFFEE COUNTY.

The Ohio & Colorado smelter at Salda is running full capacity. They have six lead-bullion furnaces with a capacity of 150 tons per day each, one matte furnace of 350 tons per day capacity and one smaller bullion furnace for refining matte from the furnace and the matte product from the bullion furnaces. Work on building the twelve roasters is under way.

CLARK COUNTY.

The final payment of \$10,000 on the Lombard-Polaris group at Yankee has been made by the Yankee Con. M., M. & T. Co. of Denver; H. I. Seeman, president. A 50-ton mill will be installed in place of the 5-stamp mill on the ground. The company will sink a vertical shaft on the Lombard and near the porphyry dyke. The first level from the shaft will be made at 100 feet and will run east under the present lowest workings, giving a vertical depth of 400 feet from the surface. In the meantime the Manhattan tunnel is being driven toward the Lombard group, which will be cut at 1000 feet deep. The company owns eighty-six claims.

J. R. Elgan, manager of the New Era Co., near Idaho Springs, says the mill is in operation. He is driving the levels ahead with machine drills and has opened up a body of milling ore.

The Santa Fe Co., operating the Gold Treasure group in Cascade district, near Idaho Springs, report opening into 5 feet of ore running \$30 a ton, with bunches of smelting ore. The ore carries gold, copper and lead. A winze is being sunk from the adit level. The same company has made final payment on the Santa Fe mine, on Seaton mountain, and have men at work stopping and drifting.

The Omar Co., driving a tunnel in Hamlin gulch, near Fall river, has struck the Paris vein at a distance of 600 feet, showing 6 feet of \$30 ore with a percentage of lead. The company will begin drifting on this lode and install machinery for further development.

W. H. Metz, president of the Centurion Tunnel Co., near Idaho Springs, says the tunnel is in 230 feet. This company owns twenty-two claims, and last week bought the Summit, Champlon and Comstock lodes on Mt. Donaldson. The Centurion tunnel is expected to cut the Champion vein within the next 100 feet at a depth of 150 feet below its present lowest workings. At 650 feet farther in the Donaldson vein will be cut, which will give a depth of 1000 feet from the surface. The property will be equipped with machinery, including a compressor.

The Indiana G. & S. M. Co. is driving an adit on the Jew lode, near Georgetown. The Treasure Mountain M. Co. has incorporated, to operate the Mary Ann group of mines at the head of Geneva gulch, near Silver Plume; to build and operate a concentrating mill on Geneva creek, near the mines, and to build smelting works near Denver. The company owns eight claims, including the Mary Ann and Lady Louise, extending 3000 feet on the Rathbone vein. Extensive development work has been planned, including the opening of a vein of iron ore carrying values in gold and silver, the sinking of a double compartment working shaft on the Mary Ann and driving a crosscut tunnel to open a series of veins which outcrop on the group. At the same time work will begin on the mill and smelter. C. C. Goodale, V. B. Straight, E. C. Gard of Denver, and H. F. Best and T. S. Reed of Savannah, Mo., are the incorporators.

CONEJO COUNTY.

The Conejos Oil Co. of Denver will start drilling in its well near La Jara next week and expect to go to 2500 feet.

FREMONT COUNTY.

The Isle G. M. Co. are preparing plans for a mill to be built at the Isle lead mine, southwest of Florence. The capacity of the mill will be 500 tons of ore a day.

GILPIN COUNTY.

The Straughton claim, in Illinois gulch, near Central City, has been taken under lease and bond by a local company. They will sink the shaft deeper. The Carcasonne Co. is opening up the same vein on their Deldrick claim.

The Gauntlet G. M. Co., owning and operating the Gauntlet and the Matt France lodes in Illinois Central district, near Central City, will sink the Gauntlet shaft an additional 200 feet to the 500-foot point. L. D. Hobson is manager.

It is reported the Gettysburg M., D. & M. Co. will resume operations at its Gettysburg group in Lump gulch, near Rollinsville, April 1, with A. M. Willard as manager. The Gettysburg shaft is down 215 feet, with 300 feet of levels driven.

Eastern parties interested in the Copper King mine in Leslie gulch, on South Boulder creek, near Rollinsville, F. Gooch superintendent, are arranging to resume operations.

The Hastle interests in a lease and bond on the Waltham mine in Willis gulch, near Central City, have been sold to Tanner, Carlson & Anderson of Idaho Springs, who will erect a shaft building and install machinery for further development work. The shaft is down 160 feet.

At the Pierce mine at Central City the shaft on the south vein is down 125 feet and connections have been made with the first level of the old shaft, says Manager E. M. Messiter.

The Register-Call says considerable placer mining will be carried on in the Gamble, Lump and Moon gulches during this season, as well as on South Boulder and Beaver creeks.

LAKE COUNTY.

Manager H. Dyatt, operating the Peerless Maud mine in Horseshoe district, near Leadville, says at a depth of 140 feet in a drift extended from the shaft he struck a body of lead carbonates, carrying 40% lead and 30 ounces silver, with some gold. The ore is similar to that he found recently in the Peerless adjoining.

J. McAllister has taken a lease and begun operation on the Park lode, near Leadville. The Park lode is east of the Mike fault and northeast of the Louisville and Moyer mines. He is shipping the product to the smelter and at a depth of 200 feet expects to take out a large tonnage.

The Fryer Hill M. Co., at Leadville, has begun shipments of low grade ore from the Stiver mine to the Arkansas smelter. This is an iron ore for which up to the present time the company has found no market.

The Chrysolite mine, near Leadville, being operated by J. Hume et al, is ready to ship a large tonnage as soon as the D. & R. G. build a spur into their ground, which will be done this month, says the News-Dispatch.

MINERAL COUNTY.

Superintendent Westlake has 200 men at work in the Big Kanawha mine, near Creede, breaking ore for the mill, which is crushing 300 tons daily.

PARK COUNTY.

A flow of gas is reported struck last week in the Olive oil well in South park, near Alma, at a depth of 1000 feet, on the property of the Illinois-Colorado O., G. & C. Co. of Chicago. The first 1000 feet of the well had been cased and drilling resumed.

The strike made in the South London tunnel, near Alma, last week has developed 3 feet of ore showing values of six ounces gold and twelve ounces silver per ton. Shipments have begun.

PUEBLO COUNTY.

The Pueblo Electric Metallic Extraction Co. has incorporated at Pueblo to operate in Fremont, Custer and Teller counties, using the Johnson process; J. H. Johnson, J. W. Tanner and C. H. Dolly.

SAN JUAN COUNTY.

The mines of the Cleveland Con. M. Co. will be reopened. This group is 3½ miles below Silverton, on the southeast side of Sultan mountain, and consists of five claims.

The Silver Ledge M. & M. Co. expect to have their new mill near Silverton in operation this month and will produce three carloads of concentrates a day. Twenty men are at work preparing to break down rock. J. B. Warner, manager, says the mill will start up as soon as sufficient water supply is available from the melting of the snow.

Work on the Congress mine, above Chattanooga, near Silverton, has been resumed by the Congress C. M. Co., composed of Boston men, with G. H. Foltz as manager. The mine is worked through a shaft and one tunnel 210 feet long, cutting the bottom of the shaft. Since this tunnel was driven the shaft has been put down 75 feet, showing a body of copper ore, shipments from which gave returns

of 18% copper, one ounce gold and twenty-five ounces silver.

The Gold Queen M. Co. was incorporated last week; G. W. Crawford, H. Riddle, W. E. Bridgman and H. J. Mayham, to open up a group of claims in upper Cement creek district, near Silverton.

The Cella Kilroy mine, on the Cement creek side of Anvil mountain, near Silverton, is being worked by H. Born. The tunnel is being driven ahead and at 275 feet it is expected that the vein will be reached 75 feet under the shaft.

The Silver Lake mill, near Silverton, is producing 60 tons of concentrates per day says the Standard.

The Mammoth Tunnel Co., A. A. Brown manager, has bought the Lead Carbonate group, Cement creek, near Gladstone, southeast of the Gold King mine. The Mammoth Company will begin development work next week. A shaft will be sunk 500 feet on the Hercules, and a tunnel run 1200 feet, which will open up the entire group. An air compressor and drill machines will be put in.

SAN MIGUEL COUNTY.

The 50-stamp mill at Ophir Loop of the Ophir Con. M. Co., W. S. Buckley manager, is treating an average of 150 tons of ore per day. The ore carries values in gold, silver and copper.

Manager Anderson of the Nellie and Ella mines in Bear Creek basin, near Telluride, says a portion of the 125 stamp mill has been employed during the winter in test runs to determine the values carried and the possibilities of recovering and retaining the same. Last week the mill shut down for general repairs, but will resume by April 1, dropping forty stamps to begin with. He has fourteen miners at work retimbering portions of the mine.

On the 3d inst the electric transformer house, blacksmith shop and other buildings at the Pennsylvania tunnel of the Smuggler-Union Co., near Telluride, were destroyed by fire.

TELLER COUNTY.

Construction work has begun on the cyanide mill of the Gold Mining and Reduction Co., which has leased the National sampler at Goldfield, to be converted into a cyanide plant. The plant will be equipped with four 100-ton tanks. The Globe Co. has a lease on the Ironclad mine, on Ironclad hill, where an experimental cyanide plant has been in operation for several months past. The ore in the mine averages \$5 per ton.

The Virginia M. G. M. Co. has granted a lease on the south 465 feet of the Lincoln claim on Gold hill, Cripple Creek, to E. W. Bowditch and E. W. Clawson, of Cripple Creek, on 20% royalty.

The Shannon G. M. Co. has leased the south end of the American Beauty claim, near Cripple Creek, to Thayer Brothers of Cripple Creek. The lease is at graded royalties, 15% on ore under \$20 per ton and 20% on ore \$20 per ton or higher. The north end of this same claim is under lease to G. C. Blake and J. H. Witt, who have a shaft down 150 feet. The American Beauty claims on Gold hill, adjoining the Jack Pot group.

The Potvin & Hatfield cyanide mill, on the site of the old El Paso mill, being built to treat the tailings dump, will be in operation next week.

The Sioux Falls & Cripple Creek M. Co., driving the Fort Wilcox tunnel into Copper mountain, near Cripple Creek, with machine drills, are in 1000 feet. The company will install a cyanide mill at the mouth of the tunnel to treat the low-grade mineral already exposed.

Two separate plants of machinery will be added to the equipment on the Jerry Johnson estate, on Ironclad hill, Cripple Creek, this month. Levison & Co. of Denver have a two years' lease on the Arapahoe claim and will put up a steam hoist. These operators will pay a graded royalty on all ore marketed, and will sink the shaft from 140 feet to 300 feet from which point they will prospect for the Pullen vein. Blocks Nos. 3 and 4 of the Arapahoe have been leased to Miller & Peterson, who will sink an additional 100 feet from the present depth of 100 feet.

The Ajax mine, on Battle mountain, near Cripple Creek, is shipping 60 tons daily of milling grade ore.

The Granville lease on the C. K. & N. mine at Cripple Creek produced in February 800 tons of ore of average value of \$50 per ton, and in January 1004 tons, averaging \$60 a ton, were taken out. The February tonnage decreased because of the interference of water which prevented operations in the 355-foot level. The water rose 20 feet above this point, but is being lowered at the rate of a foot a day by the pumping going on in the El Paso mine adjoining. The El Paso is running southwest on the C. K. & N. vein and they are 450 feet from the Raaser side line.

Machinery has been installed on the Addie C. mine, on Mineral hill, Cripple

Creek, and sinking resumed. The shaft is down 458 feet, and will go to 1000 feet. Heavier machinery will be installed at the Blue Flag mine, on Raven Hill, Cripple Creek, says Manager Erloman. It is the intention to sink the shaft to greater depth.

It is reported work will be resumed on company account on the Caledonia mine, on the south end of Bull Hill, Cripple Creek.

O. B. Finn & Co., who have the lease on the Magna Charta, on Ironclad hill, Cripple Creek, have started operations in their experimental cyanide mill, handling ten tons of ore a day.

The Times at Cripple Creek says the Arcqua mill has been leased to the King-Craig Metal Extraction Co., of Milwaukee, Wis. It is the intention to improve the mill and enlarge its capacity.

The Ivanhoe claim of the Greater Gold Belt Co. on Globe hill, near Cripple Creek, is to be equipped with an experimental cyanide plant, says Mrs. Thomas, lessee. There is water in the shaft up to the 110-foot level, which level, however, can be worked without hoisting water.

The Valley City Co., operating the Shurtloff mine on Bull hill, Cripple Creek, are sinking the shaft from 900 feet to 1000 feet. The vein has been opened up in the tenth level at a depth of 800 feet, and is showing 8 feet wide.

Babbitt & Murphy, operating a lease on the Buena Vista of the Isabella Co. ground at Cripple Creek, are installing a hoisting plant on the incline shaft and will use a skip for hoisting the ore.

Work has resumed by the Star G. M. Co. on the Commonwealth on Beacon hill, Cripple Creek. They are sinking the shaft and driving to make connection with the 400-foot level of the Star shaft and the Dan McDonald on Guyot hill. The 400-foot level of the Star shaft is under the Dan McDonald shaft, and there remains 35 feet of upraising to be done. Ore has been opened in the two bottom levels of the Star, the 300 and 400-foot levels.

IDAHO.

BLAINE COUNTY.

J. Tehe, M. Welch, E. Inama and P. Welch, working the Golden Crown claim of the United Mines Co., on Little Rock creek, near Hailey, have the shaft down 80 feet in good ore. Tehe says too much water is coming in for a windlass, and that a hoist and pumps will be put in.

CUSTER COUNTY.

It has been announced that the smelter of the White Knob C. Co. at Mackay will be started up June 1st.

The Vishnue group of mines on Custer mountain, near Custer, are reported sold to a Tacoma syndicate headed by H. Hewett, Jr., for \$15,000.

IDAHO COUNTY.

J. L. Johnson, president of the Elk G. M. & L. Co., composed of Wallace and Wardner men, has begun work on their group on Red Horse creek, near Elk City.

D. Mackenzie & Co. have bought the Irwin, McGarry, Myer interests in the Bullion group, Thunder Mountain district, near Thunder, says the Signal. The group consists of nineteen claims at the head of Holy Terror creek, a tributary of Monumental creek, and is 1 mile east of the Dewey mine.

The Barton, Brizendine and Yates claims, on Smith creek, near Thunder, adjoining the Wordenhoff properties of Hollister & Co., have been sold to H. L. Hollister for \$17,000.

J. B. Laughlin of Pittsburg, Pa., part owner of the Lucky Boy mine, near Welsch, has temporarily suspended operations at the mine.

KOOTENAI COUNTY.

Operations are resumed on the Mexico mine, at Black Tail mountain, on Lake Pend d'Oreille, near Sandpoint, says Manager Ferguson. The Wisconsin M. & M. Co., E. L. Bump, F. L. Hudson and J. W. Bishop, of Warsaw, Wis., and J. Ferguson, incorporated to operate this group. A shoot of carbonates was opened up on the Mexico, yielding \$60 per ton, chiefly in silver, and gray copper was also found.

OWYHEE COUNTY.

J. E. Mosher of San Francisco, Cal., has bonded the Banner group of claims on Florida mountain, near Silver City.

SHOSHONE COUNTY.

Manager Young of the Silver Cliff copper mines, near Wallace, says the company is planning the erection of a mill.

The New Jersey G. Co., operating at the mouth of Big creek, below Osburn, will install a 10-stamp mill in the summer. A 2-mile flume has been built to bring in a water supply. Electric power from the lines being run from Post Falls has been contracted for.

At the O. K. silver-lead mine in Government gulch, west of Wardner, a 4-foot

body of shipping galena was cut last week while driving a raise from the 200-foot level. The entire ledge is 12 feet wide and carries concentrating ore. The upper tunnel has been driven 400 feet. Near its mouth a shaft was sunk 200 feet, and from bottom of shaft a drift run on vein 650 feet, entire length being in concentrating ore. The company has decided to sink the main shaft 200 feet deeper. It was decided at a recent meeting to build a concentrator this spring on their millsite on the river, a mile below the mine.

The Western Star-Big Creek M. Co. has been incorporated by G. W. Sparenberg, S. Teichle and H. Loeber of Wardner and H. J. Rossi, T. Riddle and S. P. Fairweather of Wallace. Their claims are near the mouth of Big creek, east of Wardner.

MICHIGAN.

The results at fifteen mines in the Lake region for February show that 24,500 tons of rock were stamped daily, producing 333 tons of refined copper.

HOUGHTON COUNTY.

The February product of the Atlantic mine, near Houghton, amounted to 298 tons, the greatest February product in the history of the mine. The rock is yielding 17 pounds of mineral per ton. The Wolverine output was 485 tons and the Mohawk 354 tons.

The Baltic mill, near Houghton, started up the fourth head of stamps last week.

The annual report of the Atlantic M. Co., near Houghton, for the year 1902 shows production of mineral of 6,847,270 pounds, yielding 72.28%, or 4,949,366 pounds of refined copper, for which there has been realized 11.88 cents per pound. The mineral produced by this mine is mass copper.

J. R. Stanton, treasurer of the Winona M. Co., near Houghton, says: The development work of the past year in the ground south of No. 2 shaft has opened up a lode of such a character as to warrant further explorations in that direction. For a working test of the rock, one head of stamps in the Atlantic mill was leased, and during the months of December and January, 8795 tons of rock were stamped, which yielded 23 pounds of ingot copper per ton.

KEWEENAW COUNTY.

The Ahmeek, near Allouez, has struck the Kearsarge amygdaloid in the vertical drill hole from the bottom of the small vertical shaft at a depth of 214 feet, and showed a width of 15 feet. A crosscut is being run to intersect the lode to the east from the bottom of the shaft at a depth of 100 feet and is expected to strike the lode in 140 feet. Fourteen feet before the true lode was cut, the west or minor Kearsarge was struck, proving the identity of the lode as found in the north Kearsarge and Mohawk.

The Fort Federal Copper Co., organized at Duluth, Minn., has bought 3600 acres east of the Misawabic and 1 mile southeast of the Phoenix mine, near Phoenix. L. L. Hubbard is consulting engineer.

MARQUETTE COUNTY.

The Copper Range management is preparing to begin active work on the smelter, near Marquette, west of the old Atlantic millsite on Portage lake. G. Case, of Butte, Mont., will superintend erecting the smelter and its operation. The capacity will be sufficient to handle mineral from all the South Range companies.

MISSOURI.

JASPER COUNTY.

The output of the American Z., L. & S. Co. at Carthage for the week ending Feb. 28th is reported by C. W. Landrum, superintendent, as follows:

	Lbs.	Value.
Zinc.....	10,511,630	\$161,600
Lead.....	1,029,830	29,385
Total.....		\$190,985

The following is the output for nine weeks:

	Lbs.	Value.
Zinc.....	76,077,770	\$1,187,173
Lead.....	9,150,890	233,314
Total.....		\$1,422,487

MONTANA.

DEER LODGE COUNTY.

The Cable gold mine, in Georgetown district, west of Anaconda, is in operation and twenty stamps are dropping.

FERGUS COUNTY.

Articles of incorporation of the Judith Basin M. Co. were filed last week at Lewiston; G. W. Cook, G. J. Bach, A. G. Steinberg, E. H. Cook, A. C. Bach.

The Gold Reef mill, near Lewiston, resumed last week, after a temporary shut-

down to increase its capacity. They are working 300 tons per day.

D. Scott, manager of the Mammoth Group G. M. Co., near Gilt Edge, says their mill is in operation and handling fifty tons of ore per day. They have opened up the ore body 200 feet long, 25 feet wide and 20 feet high, which averages \$8 per ton.

LEWIS AND CLARKE COUNTY.

The Iowa M. Co. has incorporated at Helena; R. W. Hughes, P. B. Merritt, I. H. Adams and J. E. Himmill.

PARK COUNTY.

The Bonanza Hydraulic M. Co. has been incorporated by H. J. Miller, H. Dyer and W. M. Carr of Livingston to operate in the Bear Gulch mining district.

SILVER BOW COUNTY.

The output of the Anaconda mines at Butte is 5200 tons of ore per day, but the quantity treated is in excess of that amount, as the company buys custom ore. The larger part of the ore taken out at the company's mines in Butte goes to the Washoe smelter at Anaconda, but a large tonnage is treated at the Butte & Boston and Colorado smelters, owned by the Amalgamated Co.

Machinery for the Pittsburg M. Co. mill near Butte is on the ground, says Superintendent F. Farrell. The mill will use the Bagley process. In addition to the mill there will be a wire and sheet copper factory.

NEVADA.

ELKO COUNTY.

The Leonard Taylor M. Co. has bought the A. H. Smith mine, near Tuscarora, including the 10-stamp mill and cyanide plant. Electric power will be installed and the mill capacity increased.

A 50-ton milling plant will be installed at the Deer Creek group, 8 miles east of Gold creek. A body of gold-silver ore has been blocked out, says Manager A. Carlson.

Pittsburg men have bought the Nelson mining property near Mountain City. It is intended to install a 60-stamp mill.

HUMBOLDT COUNTY.

The Glasgow & Western Exploration Co. smelter at Golconda has been blown in, says J. Farren, superintendent. At the Adelaide group he has 100,000 tons of copper ore ready to be treated, and at the Star group on Cherry creek the ledge has been opened up to a depth of 700 feet.

J. P. Fitting, of Foltz, is putting in a hydraulic plant on the properties owned by J. B. Foltz, of Foltz. Storage reservoirs will be built and the water used in washing restrained by dams. This year the abundance of snow assures a good supply of water.

The Nevada mine, in Donnelly Mountain district, on the west side of Black Rock desert, is reported sold to J. H. Harp and W. Ross. The mine produces some specimen-gold rock.

LINCOLN COUNTY.

The Southwest M. Co. of Philadelphia, operating at El Dorado canyon, has a 25-stamp mill on the Colorado river. The company is doing development work and intends later on to move its mill up to the mines. They have a whim in operation on their Wall Street claim.

At Knob Hill, 18 miles north of Searchlight, Hare & Hunsaker will put up a mill on their property.

The Horseshoe mine and mill, near Fay, have been sold to the owners of the Charley Ross and Buck mines. A double-compartment shaft will be sunk on the Buck vein.

NYE COUNTY.

(Special Correspondence).—The Paymaster mine on Lone mountain, 27 miles from Butte, has made a strike. The ore is reported increasing in quantity and value. The vein at present is 18 inches wide, lying between a lime foot and a porphyry hanging wall. On the foot there is a streak of galena 8 inches wide, which assays 275 ounces in silver, and next to that a 10-inch quartz streak assaying as high as \$65 in gold and 254 ounces in silver. The shaft is down 62 feet and sinking will be continued. J. Zweifel is superintendent.

The Indiana properties, 1 mile east of Butte, are sinking a double-compartment shaft. The work will be continued by windlass until their new 40 H. P. hoist arrives. F. Dunn is superintendent.

The California-Tonopah Co. are sinking a shaft to the 500 level and will then crosscut for the vein cut at the 145-foot level, where it was 30 feet wide. J. W. Donnelly is superintendent.

Sinking has been resumed from the 600 level on the Desert Queen shaft of the Belmont M. Co. Same will be sunk to the 800 level. J. J. Jordan is superintendent.

The Nevada-Alpine M. Co. are shipping 3000 sacks of ore per month, which runs

335 ounces silver, \$4 in gold, 4% copper and 60% lead. The tunnel is driven on the vein, which is nearly flat, and is now in 85 feet. The ore is being sacked at the chutes. C. S. McCarthy is superintendent.

The King-Tonopah Co. are erecting a 12 H. P. gasoline hoist, which will be used until the arrival of a 44 H. P. plant in about two months. The shaft is down 212 feet and will be sunk to the 600-foot level before crosscutting is commenced. H. J. Loughran is superintendent.

Tonopah, March 8.

Superintendent H. C. Jones of the Manhattan-Tonopah M. Co. at Butte, says he will sink a double-compartment shaft 500 feet.

The Home Run M. Co. has incorporated at Butte; S. P. Santos, T. Sullivan, H. H. Brown, F. J. Slebert and J. Travass directors.

Tonopah-Union Shaft No. 2, near Butte, is down 182 feet. Values in the ledge cut at the 155-foot level are reported to show \$150 per ton. The shaft is being operated by a whim, which will be replaced by a steam hoist. Shaft No. 2 will be sunk to 250 feet before crosscutting again.

The Commodore M. & D. Co. has been incorporated by Pittsburg, Pa., and California men, to develop a group of claims 14 miles north of the Central mines, on the mineral belt extending from Tonopah to Ray, along the northern base of Mount Ararat, near Butte. Their two-compartment shaft is down 50 feet and a steam hoist will be put up.

The directors of the Tonopah Cash Boy M. Co., J. D. Torreyson, president, have decided to install a hoist and other machinery at their mines near Butte.

The Tonopah Gold Belt M. Co. has been incorporated under the laws of South Dakota, to operate a group of five claims on the northwest slope of Gold mountain, near Butte. F. L. Talcott of San Francisco, Cal., is president, and F. Everett is manager.

The Lucky Tom M. Co., owning seven claims on Gold mountain, adjoining the Coleman group, near Butte, have begun development work, and will sink a double-compartment shaft.

The Tonopah-Belmont Water Co. has incorporated in Nevada for the purpose of piping water from the Combination springs, near Belmont, to Tonopah. The promoters say they will be able to supply 150,000 gallons of water per day and will be in position to furnish the water by June 1 next.

Six feet of quartz have been opened up in the crosscut from the shaft of the Hanapah G. M. & S. Co., 15 miles east of Butte, says Superintendent F. Work. Assays show an average of 220 ounces silver and \$6.50 gold.

STOREY COUNTY.

The 10-inch Davis calyx drill hole being put down from the surface in the east wall or Brunswick section of the Comstock at Virginia City for prospecting purposes is down 1000 feet. The hole is reduced to 5 inches and is in clay and porphyry with quartz boulders giving small assays.

C. Sharon, manager of the Equitable M. Co.'s ground, in Flowery district, near Virginia City, says 8 feet of free milling ore has been opened up, running \$30 per ton.

A station has been cut on the 1200 level of the Caledonia mine at Virginia City, and an air compressor will be installed. Electricity will be used, with a 30 H. P. motor to run the compressor. The Caledonia Co. made a shipment of thirty railroad cars of ore to the Brunswick mill this week.

WHITE PINE COUNTY.

The shaft at the Ruth mine, near Ely, is being enlarged and retimbered to the 300-foot level.

NEW MEXICO.

GRANT COUNTY.

The International M. Co. are operating their mines in the Malone district near Lordsburg. On the Gold Brick they have a horse whim in operation and are hoisting from an incline shaft 120 feet deep.

RIO ARriba COUNTY.

W. M. Woody, manager of the company operating a group of mines at Glenwood, 3 miles above Rinconada, on the Rio Grande river, says 1300 feet of flume have been built and it is expected the mill will be finished and in operation by May 1. Water power will be used. The plant is expected to save \$8 in gold per ton of ore handled. At present thirty-five men are at work. The same company owns a group of mines at Cieneguilla which contain ores showing gold, silver and copper, of average value of \$18 a ton. About 200 feet of tunnel and shaft work has been done and the ore will be smelted at Glenwood camp.

OREGON.

BAKER COUNTY.

At the Ross Gulch mine, near Sumpter, Superintendent D. D. McLeod has finished a crosscut on the 165 level showing the vein 18 feet wide of milling ore. This crosscut was made from the drifts being extended north of the shaft.

Work has begun on the Highland group of the Highland G. M. Co., says Superintendent M. L. Lohmire. It is intended to open the vein at greater depth by crosscutting on the Glasgow and Bannock Burn.

Manager Buckbee of the Virtue Con. M. Co., operating the Virtue mine, near Baker City, says he is sinking a new shaft to open the parallel vein, independently of the old Virtue working shaft.

The Combination G. M. Co. has been incorporated to operate the Combination group on Baldy mountain, 1½ miles south of Cable Cove, near Sumpter; A. Philbrick, S. R. Stott, J. C. Daves, A. P. Goss, C. H. Fenner, J. N. Hudson, F. M. Saxton.

The Listen Lake Co. has bought the Copper Butte claim, adjoining the Iron Dike, of the company's copper group, in McNamee gulch, near Sumpter, giving them a total of five claims.

President Thomsen of the Columbia Extension G. M. Co. says work will be resumed on the Ohio ground of that company.

A milling plant will be installed at the Emma mine, near Baker City, says Manager W. L. Vinson.

Yamhill men have bought the Summit Butterfly group, Cable Cove district, near Sumpter, says the Miner, and work has begun.

JOSEPHINE COUNTY.

W. E. Olmstead, manager of the Mountain View Copper Co., that recently bought the Scribner-Henderson mines near Wolf Creek, says he will install a 30-stamp mill.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Hidden Fortune mill, on White-wood creek, below Deadwood, is expected to be in operation by April 1. The mill is 4½ miles from the mine, involving a railroad haul of ore. The mill is a wet crushing cyanide plant, the ore being pulverized with stamps in a solution of cyanide of potassium. There are sixty stamps, each weighing 1050 pounds, and will run at ninety drops per minute. The mortars are of the double discharge type, the coarse crushing being done by a Blake crusher, from which the ore will be conveyed to the stamp batteries by a 24-inch belt conveyor. At the mine the triple-compartment shaft is down 150 feet below the floor of the Baltic tunnel. A station will be cut at 200 feet and a crosscut driven to the east on the Bingham vein. This vein is crosscut by several drifts from the Baltic tunnel. It is intended to double the size of the present mill and to build another plant, on a site yet to be selected, having 200 stamps.

TENNESSEE.

WAYNE COUNTY.

Near Waynesboro, Pittsburg men are reported to have bought 72,000 acres in the Southern iron belt, and an initial investment of \$5,000,000 is to be made in developing the properties. Furnaces will be built, rolling mills and other plants for finishing erected.

UTAH.

BEAVER COUNTY.

Manager B. Lloyd of the Copper Mountain M. Co. says they are putting up a 12 H. P. gasoline hoist at their mine on Copper mountain, near Milford.

The Wild Bill M. Co. are shipping a carload of ore per day from their two groups, the Wild Bill and the Burning Moscow, near Milford. This ore nets the company \$500 per car, after paying transportation and treatment charges. The railroad company has built a siding at Hay Springs, 5½ miles from the Burning Moscow, and another will be built at a point on the Frisco branch 5 miles from the Wild Bill.

Manager True of the Blackbird M. Co., near Frisco, says they have resumed operations and are sinking from the 240-foot level. A crosscut will be run to the ledge.

The Milford C. M. & S. Co. has incorporated; G. H. Dern, F. Y. Taylor, C. E. Hudson, H. Dinwoody, E. H. Alris, G. Romney and F. H. Lathrap. The property of the company consists of eleven claims near the O. K. mine of the Majestic Co., near Milford.

Manager Lane of the Success M. Co., near Milford, is preparing to sink a double-compartment shaft 300 feet. The work will be started on the 30-foot shaft, which will be enlarged, and at 200 feet a cross-

cut will be run to get under a 50-foot shaft which is in ore.

Superintendent P. M. McCree of the Blackbird mine in Copper gulch, near Milford, says he has men at work pumping out the shaft and getting ready to reopen the mine. The shaft, which is down 230 feet, will be continued and sinking also will be resumed on the shaft 1000 feet to the west. Later on power drills will be installed.

Manager B. Lloyd of the Copper Mountain Co., in Beaver Lake district, near Milford, says development work will be increased and a 12 H. P. gasoline hoist, with gallow-frame, shaft house, carpenter and blacksmith shops installed. The shaft, down 200 feet, will be sunk to 600 feet. From the 200-foot point an incline drift will be run 200 feet in copper ore.

BOX ELDER COUNTY.

P. W. Madsen, president and manager of the Century mine at Park valley, reports shipping last week a gold bar of \$3300 value, the product of a ten-day run at the plant.

EMERY COUNTY.

Work has resumed on the properties of the Hecker M. Co., near Woodside, says Manager H. Hardy.

IRON COUNTY.

The Johnny M. Co., at Stateline, are reported to have added the Bast mines to their holdings in that district.

JUAB COUNTY.

The first week since the introduction of the tribute system at the properties of the Bullion-Beck M. Co., near Eureka, closed with twenty leases in operation and forty men employed.

Several leases have been let on Humboldt ground by the Uncle Sam M. Co., near Eureka. The company is working the north end of the group and going ahead with plans for a concentrator.

The old workings of the Joe Bowers mine, at Silver City, are being put in repair by Superintendent G. Paxman. A hoist is being placed.

J. A. Beaman of Silver City has begun work on the Silver Queen.

Superintendent J. McChrystal of the Gemini mine of Tintic, near Eureka, says they are producing 1400 tons of shipping ore per month.

PIUTE COUNTY.

(Special Correspondence)—The Franklin G. M. Co., operating the Wedge property, have recently increased their capital stock to \$2,500,000 to complete the acquisition of additional territory in the Mount Baldy and Ohlo mining districts. A trial shipment of ore recently made on the Wedge by Superintendent H. L. Mills netted \$275. The carload was divided into two lots, one of which was first class and the other an average of the milling rock. The former gave returns of \$240 and the latter \$23 in gold.

The B. W. & H. in their crosscut have an ore body about 16 feet in width averaging \$20 per ton in gold. It is a network of ore streaks varying in size up to 6 inches in width, which averages \$20 gold and seventy-five ounces silver. Superintendent J. M. Billingsly is pushing the work toward the Jim Crow ledge, which on the surface gave an average of \$4 across 40 feet.

A deal is reported of the transfer of fifty mining claims, townsite and facilities for power, also reduction works near Marysville. Washington, D. C., and Pennsylvania men are the buyers. It shows the interest taken in this part of Utah, and in the Ohio and Mt. Baldy mining districts.

Articles of incorporation of the Henry Bradburn M. Co. have been filed. The company has been organized under the laws of West Virginia. They own ten claims on the north fork of Cottonwood.

A. Gore, superintendent of the Tribune group, reports that 200 feet will put the face into the large north vein, the croppings of which parallel the large porphyry dyke that runs through the Tip Top group.

It is reported that the Sevier Con., near Marysville, will be operated more extensively the coming season. Plans are being prepared for the remodeling and enlarging of the mill, and possibly the construction of a new one.

Marysville, March 8.

SALT LAKE COUNTY.

Superintendent Rookledge is taking out lead and silver ore at the Howland group at Alta.

The fifth furnace at the United States M. Co.'s smelter at Bingham was blown in on the 5th inst., says H. K. Masters, superintendent of the plant, increasing the capacity to 800 tons of ore daily.

Manager Jacobson of the Columbus Con. mine at Alta says last week they opened up a vein showing 8 feet of milling ore which averages \$10 per ton; 2 feet of the vein is smelting grade and assays \$40.

Shipments will begin next week. The proposed mill, in which the lower-grade product will be treated, will be erected this spring.

At the annual meeting of the Columbia C. M. Co., held last week, Secretary F. Cook stated that since Jan. 1 they have marketed from their Bingham mines crude ores and concentrates which yielded 148,000 pounds of copper, of which 75,000 pounds marketed during February sold for \$5900. Twenty-one men are on the payroll.

R. D. Evans and S. W. Winslow, trustees of the United States M. Co., have issued the following report to the stockholders:

Prior to January 1, 1903, only four carloads were shipped East from the smelter, containing 244,680 pounds of bullion, for refining, worth 29.2 cents per pound. Since January 1 twenty-one carloads, containing 1,276,440 pounds of bullion, worth 29.7 cents per pound, have been shipped. These values are based upon silver at 47 cents per ounce and copper at 11½ cents per pound. A contract has been made for the refining of all the product of the smelter, and all the bullion has been sold for a term of three years, the price per ounce of silver and per pound of copper or lead to depend upon the market price. The total amount expended since January 1, 1900, has been \$1,706,164.31, of which \$892,987.03 has been expended in construction and operation of the smelter and auxiliary works, and \$813,177.28 in buying new properties, in the development and equipment of the mines, in the payment of interest and general expense. The total amount received from the sale of bullion is \$382,500, and the amount still unpaid on bullion shipped is estimated at \$69,319.

SEVIER COUNTY.

At the B. W. & H. group, in the Henry district, near Marysville, they have finished crosscutting the 17-foot vein that was tapped by the tunnel while driving for the main lode. From this "blind" ledge eighty sacks of ore were shipped, yielding \$40 per ton in gold and silver. The upraise from No. 3 level has reached an elevation of 100 feet, the entire distance being in ore running \$60 per ton.

WASHINGTON COUNTY.

The Virgin Falls Oil Refining & Exploration Co. has incorporated at St. George; W. J. Riekell, J. T. Affleck, D. J. Smith, A. F. Gregerson. The company owns fifty-six placer claims near St. George.

WASHINGTON.

FERRY COUNTY.

J. W. McCann, lessee of the North San Pol mine, near Republic, says he is shipping ore to Nelson, B. C. The north drift on the 100-foot level is in 40 feet and the south drift 30 feet, both in shipping ore.

The Comstock LaFleur mine, near Republic, has been leased to McNeely and Pettit.

STEVENS COUNTY.

The Manora mine, near Bossburg, has a diamond drill in operation, prospecting below the 200-foot level. The Colville Co. is making preparations to determine, with a diamond drill, the extent of its ore bodies.

The United States Marble Co. is making shipments of green marble from its quarries near Valley to New York for decorative building uses.

The Miner says the Le Roi smelter at Northport, having arranged for a supply of coke, blew in two furnaces this week, and the other furnaces will be blown in as their coke supply increases. The company has 60,000 tons of ore piled up at the yards.

WYOMING.

LARAMIE COUNTY.

The Hecla C. & G. M. Co. of Denver, Colo., have bought the Louise and Victor copper and gold mines at Silver Crown, 20 miles north of Cheyenne, for \$15,000.

SWEETWATER COUNTY.

The Belgo-American drilling trust have begun drilling operations in the Salt Wells oil field, near Rocky Springs, and one rig is in operation. Twelve more rigs are being built, and they expect to erect at least twenty-five.

UINTA COUNTY.

It is reported that at Spring Valley last week miners working in No. 3 shaft at the Spring Valley coal mines opened up a fissure from which a stream of oil 2 inches in diameter flowed, accompanied by gas. Twenty-five barrels of oil were baled out of the shaft on the 4th inst., but the oil gained on them.

FOREIGN.

AFRICA.

TRANSVAAL.

The Cinderella Deep borehole has struck the conglomerate body of the

main reef at a depth of 3309 feet. At the bottom it is 16½ feet wide, 4 feet of which have given assays of 10 dwt. and 12½ dwt. The strike is of general interest, as it proves that payable gold reefs exist under the whole of the townships of Boksburg and Vogelfontein, which adjoin the northern boundary of the Cinderella Deep property. The mining rights under these townships belong to the Government and are included among the special assets which it is intended eventually to realize toward redeeming the Transvaal's contribution to the war debt. The townships are equal in area to 160 mining claims, and assuming they are only half the value of the claims belonging to the adjacent outcrop mines this asset alone would provide over a million and a half towards the reduction of the Transvaal's thirty million war loan. The strike is also important as affording further proof of the continuation of payable reefs into the deeper levels. The feature in this case is the great width of the reef. This, taken in conjunction with the results from the Turf Club borehole, goes to demonstrate the probability that the intervening area of 14 miles of deeper levels is auriferous.

AUSTRALASIA.

The production of gold in Australasia in 1902 was valued at \$81,020,324 (\$3,500,000 more than in 1901), according to a report to the Secretary of State from U. S. Consul-General Bray of Melbourne. Of this \$71,000,000 is credited to Australia and the balance to New Zealand.

BRITISH COLUMBIA.

It is reported at Nanaimo the Alexandra mines will be reopened. New bunkers will be built. The Wellington Colliery Co. is boring for coal a few miles north of Ladysmith. The demand for the product of the Island mines is such that thirteen vessels of all classes were at Ladysmith on the 1st inst. At Extension the output will be increased by the addition of a third shift. Two hundred men will be put on at the Protection mine. Work has been resumed at the Western Fuel Co.'s mines.

H. H. Claudet, manager of the Canadian Ore Concentration, Ltd., and the Le Roi No. 2 management, announce that an arrangement has been made for the erection of a 2-unit Elmore-process plant, to treat fifty tons daily of Le Roi No. 2 ore. The mill will be on the Annie and below all three dumps—the Annie, Josie and No. 1—to work by gravity, a fall of 50 feet being necessary.

Manager G. W. Stead says in drifting to intersect the surface showing on the Lucky Boy, near Trout Lake, when in 37 feet they cut a body of concentrating ore 3 feet thick, with a 10-inch vein of gray copper on one side showing some galena. The assay of an entire section of the vein shows 1000 ounces of silver.

At the Kootenay mine of the Rossland-Kootenay Co., near Rossland, stoping operations have begun on the third and fourth levels with two machines in each, and by the 18th inst. the crew will number at least fifty men, says Manager W. Thompson.

Owing to closing of furnaces at Trail smelter, forty of the fifty men at work at the Ilme quarry, near Cascade, have been laid off.

Manager Moyer of a Philadelphia company has an option on the Horseshoe mine on Trout creek, near Ferguson. The Horseshoe is in the same belt as the Ethel and Lucky Boy and adjoins the Grouse groups, which show gray copper and galena.

An electric plant has been installed at the Union Jack mine, near Ymir, says Superintendent Cameron. The Wilcox mine, near Ymir, has been temporarily closed down owing to the heavy snowfall which has stopped traffic.

The Payne mine, near Slocan City, is taking on more men, says Manager Garde.

The Fisher Malden, on Four-Mile near Slocan City, has shipped eleven cars of ore since the first of the year. Twenty men are employed.

The Blue Bird mine, 3 miles from Deer Park, has been unwatered, and stoping began this week. The mill will begin operations next week, says Manager J. E. Wardman. A compressor will be put in. The workings consist of an inclined shaft down 100 feet and horizontal workings extending to a point giving 200 feet vertical depth on the vein. The ore is silver-lead with some gold and copper and the vein 5 feet in width, with paystreaks on both walls. The whole body will average \$8 per ton, says Wardman.

At the Oyster-Criterion mine, near Lardau, machinery for the stamp mill is on the ground. A compressor will be put in and an aerial tramway installed this spring.

The Estella mine on Tracy creek, near Fort Steele, has closed down pending the building of the railroad to that section, says Superintendent C. H. Pollen. The

main tunnel on the Estella is in on the ledge 1200 feet, showing in crosscuts a width of 12 feet of concentrating ore and 3 feet of galena. As the Estella is 10 miles northeast of Fort Steele and 16 miles from the nearest railroad, Mr. Polien says his company has secured control of the Kootenay Central railway charter, with the intention of building a branch road to get their ore out. It is a low-grade silver-lead proposition and carries zinc ore. A mill-site on Tracy creek has been bought and a concentrator will be built this year.

J. Nelson has men at work on the Copper Crown group of copper claims near the Canadian Pacific railway at Isidore canyon, near Fort Steele. It is intended to drive a tunnel to get 100 feet depth on the ledge below the old shaft, which was abandoned because of water.

At the White Bear mine near Roseland the drift started from the 900-foot station broke into a body of copper ore last week. A five-ton shipment to the smelter showed 12% copper, says Manager B. Macdonald.

Returns from the Ymir mine at Ymir for January show during the month 4200 tons of ore crushed with sixty stamps running twenty-nine days, yielding 1711 ounces of bullion—gross estimated value, £4072. There were 265 tons of concentrates shipped, at a gross value of £1804. The cyanide plant treated 2350 tons; gross estimated value, £825. Total working expenses for month, £3350. Expenditure on capital account (cost of development), £515; sundry receipts, £165, with net profits of £2380.

The Atlin G. M. Co. has been incorporated to take over the Atlin, Nome No. 2 and Nome Fraction mineral claims, on Dundee mountain, 1½ miles from Ymir and adjoining the Dundee mine.

J. Dunsmuir, president of the Wellington Colliery Co., has ordered the Extension mines, near Nanaimo, to be shut down. It is said this is the mode the company has taken to answer its employees when they signified a desire to join the Western Federation of Miners. About 1000 miners are affected.

MEXICO.

CHIHUAHUA.

A strike has been made in the Cinco de Abril mine, near Acampo, of a 14-inch paystreak that assays 400 ounces silver and 40 ounces gold, says Superintendent S. Dedrick. Outside of this the vein is 13 feet wide and the ore shoot runs 12 feet per ton. On the Sierra Boluda mine, Dedrick reports 400 feet of drifting done on the 50-foot level and 225 feet on the 110-foot level—all on a vein 20 feet wide with a pay shoot sampling \$11 in both drifts. This mine is owned by the Camrose Syndicate, Ltd., H. Nathan, general manager.

Near Ojo Caliente, Broz & Daley of Ahumada have bonded for \$45,000 in gold the Grito de Dolores, Yndependencia, Constitucion and Oriente mines. They carry silver, lead and gold.

Manager J. S. Eldridge reports striking a shoot of 300-ounce silver ore in the La Fortuna mine, in the San Joaquin mountains, 21 miles from Nueva Casas Grandes. The strike was made at 300 feet in the shaft. The vein is 22 feet wide and averages thirty ounces.

Palmer & Berg are shipping 200-ounce silver ore from the Lincoln mine, in the San Joaquin mountains, 21 miles from Nueva Casas Grandes.

An English company, known as the Cherokee-Mexican Proprietary, Ltd., is operating a gold group near San Julian.

DURANGO.

The Guggenheim Exploration Co. has an option on the Caballo mine of W. S. Benton at Inde.

The smelting plant at Torreon is to be enlarged.

NEUEA LEON.

The Torreon Enterprise says an American company is working the salt mines at Sabinas, and has recently put in \$70,000 worth of machinery and is sinking a shaft 325 feet deep.

SONORA.

(Special Correspondence).—The Venice Copper Co., on the Yaqui river, 75 miles east of Minas Prietas, is operating the Magnolia and La Brisa. They have 3000 feet of work done on the La Brisa. The ore runs forty ounces in silver, \$10 in gold and 26% copper. They have a 60-ton smelter on the ground ready for erection, and expect to have same in operation in ninety days.

The Missouri & Mexico M. Co. are starting operations on their property in the Yaqui River district, 10 miles north-east of Suque Batuca. The ore runs 10% copper and high in silver and some gold. Surface showing is good, all ledges being very large.

Soyopa, Sonora, March 3.

(Special Correspondence).—Unless negotiations now pending terminate favorably, the Grand Central mine will close down

and probably be moved elsewhere. During the past three years the cyanide plant of C. Butters & Co. has treated 300,000 tons of tailings from the Grand Central and are about through. They are now endeavoring to make a contract with the Grand Central to treat low-grade ores from the mine. The Butters Co. is considering the erection of a plant at Copala, Sonora. F. M. Perry is manager and superintendent of the cyanide plant at La Colorada.

The 30-stamp mill of the Crestone Colorado Co. is handling 200 tons of ore per day. They are using eight Huntington mills in connection with the stamps, which gives them the large output. They do the coarse crushing in the batteries, finishing in the Huntingtons. Vanners are used for concentration. At the mine they have a 60 drill compressor and large hoist. The shaft is down 1100 feet. They have also a machine shop and foundry. Ore is transported from the mine to the mill by tramway; 350 men are employed, including a large number of Yaqui Indians.

La Colorada, March 6.

(Special Correspondence).—The San Fernando mine, 4 miles from La Colorada, has just commenced development. The assays show copper, gold and silver; H. C. Dougherty, manager.

La Colorada, March 6.

The Herald says the output of the Cananea smelters is eighty tons of copper daily.

A shaft is being sunk on the Pollock mine, near Douglas, Ariz. The property is near the wagon road and ore can be brought to Douglas at low cost.—Work will begin next week on the Fourth of July group, owned by the Atlas E. & M. Co. This company has three groups in this district. Assays from an 18-foot shaft, says the Miner, show \$30 gold, 200 ounces silver, 15% lead and 1% copper.—The Pavo Rico continues to ship ore and a new shoot has been struck in Tunnel No. 2, the ore assaying \$10 gold, with values in silver, copper and lead.

The Yaqui S. & R. Co. of Hermosillo, which is composed of Toledo, O., men, is about to let a contract for a considerable amount of machinery, including a 100-ton smelter, to be erected at San Antonio de la Huerta.

Last week the San Blas mine at Colorada, in Altar district, was sold to an Eastern company, J. A. Singley of Caborca manager, for \$5000. Development work will begin this month.

M. Gavito, B. Dubuch, G. Milhe, F. Glinder, J. Burrell and J. Urrere have organized the La Raja G. M. Co. at Naco. They have denounced ten pertenencias in the La Mestenas mountains, 28 miles from Naco. Development work will begin this month.

The Las Tajas M. Co. has incorporated at Tucson, Ariz., to operate the Las Tajas copper mine, near Zubiate; K. L. Hart, B. L. Worthen, T. J. Turner, L. F. Swain, P. E. Murry and H. Kains. They have a ledge 100 feet in width showing values in copper, gold and silver. A tunnel to cut the ledge at depth is being run, and is in 160 feet.

The Nogales C. Co., of Nogales, Ariz., has bought the Cerro Prieto gold mines, near Magdalena, for \$700,000.

The Cerro Escalado G. M. Co., near Nacozari, expects to put up a 10 stamp mill this spring.

NEW SOUTH WALES.

J. D. Kendall has examined the Cobar copper mine for the Amalgamated Copper Co. of America. English investors have neglected Australian copper and tin mines, and a number of Americans, seeing the opportunities, are planning large schemes. For several years past they have contracted for the purchase of the output of copper and tin from some of the leading mines in New South Wales, and they now propose to purchase the mines outright.

Successful experiments continue to be made at Broken Hill with the Delprat ore concentration process. In the first process the sulphide ores, including the products and waste from other metallurgical processes, are finely pulverized and divided. They are then immersed in a bath and the sulphides rising to the top are skimmed off or otherwise removed. No special plant or machinery is necessary for the immersion process. The powdered ore being fed into an inclined launder makes its way by gravity to an ordinary steam-jacketed pan or vessel, or into one set above an ordinary furnace. The ore then drops slowly into the bath. The bath consists of a solution of salt cake in water, of a specific gravity approximating to 1.410. The solution is kept hot, but preferably not allowed to boil. As an alternative the hot bath consists of a solution of sodium sulphate in water, to which is added free sulphuric acid, so that the resultant will approximate 1.410. As the ore immerses itself in the heated bath, the sulphides disengage themselves from the gangue, rising to the top, whence they

may flow away or be skimmed off. The second process consists in the ores being dropped into a heated bath of nitrate of sodium, nitrate of potassium or nitrate of zinc, dissolved in water, to which is added dilute nitric acid, so that the result will have a specific gravity of 1.410, though a little lighter or heavier does not matter. The sulphides in this process also rise to the top, and then flow away, or may be otherwise removed.

SWEDEN.

The Slangell copper mines, near the boundary between Norway and Sweden, are reported sold to an American company for \$1,000,000.

TASMANIA.

The Mount Lyell mine continues its output of 1000 tons of ore a day. The manager has been examining the mines in the Rosebery district, 50 miles distant by rail from Queenstown, where there are said to be some promising low-grade properties. In the quarterly returns to September 30th the North Lyell output is given at 8420 tons, the ore averaging over 10%. The deeper workings have recently exposed some rich ore.

PERSONAL.

H. G. MCKINNEY of Kansas City is now in Sonora, Mexico.

A. E. KLAUSER, Toledo, Ohio, is at Hermosillo, Sonora, Mexico.

G. KARTSCHAKE is in San Francisco, Cal., from Nevada City, Cal.

W. L. MARKS is manager of the Bertha mine, near Idaho Springs, Colo.

W. J. ROBINSON, a miner from Atlin, B. C., is in San Francisco, Cal.

T. W. FOSTER has returned to Batuca, Sonora, Mexico, from Kansas City.

W. R. BEALL, a mining man of Redding, Cal., is in San Francisco, Cal.

JESSE J. SCOBEE is in San Francisco en route from Arizona to Denver, Colo.

M. L. LOHMEIE is superintendent of Highland G. M. Co., near Sumpter, Or.

J. BRESNAHAN is superintendent of the Republic Con. M. Co. at Republic, Wash.

G. E. NORTHEY, a quicksilver miner of Sulphur Creek, Cal., is in San Francisco, Cal.

F. LEONARD of Salt Lake City, Utah, is in Kansas City, Mo., on mining business.

E. F. PAGE has returned to Colorado Springs, Colo., from La Dura, Sonora, Mexico.

A. M. WOMBLE of San Francisco, Cal., is examining mining properties at Tucson, Ariz.

G. H. BARNHARDT has resigned as superintendent of the Ymir mines at Ymir, B. C.

M. C. GARDNER, JR., E. M., of Carson, Nev., is at Tonopah sampling the Mizpah dumps.

D. MCVIEHIE of Salt Lake City, Utah, manager of the Bingham Con. M. Co., is in Boston, Mass.

T. B. SCOTT, owner of the Lucky Boy mine, near Chloride, Ariz., is at Chloride from Chicago, Ill.

W. F. SNYDER, of Salt Lake City, Utah, manager the Bingham Con. M. Co., is in Boston, Mass.

J. B. LAUGHLIN of Pittsburg, Pa., part owner Lucky Boy mine, near Weiser, Idaho, is at Weiser.

W. C. URBAN, general manager Venice Copper Co., has returned to Venice, Ill., from Sonora, Mexico.

R. W. RODDA has resigned as mine superintendent of the Horseshoe M. Co., near Deadwood, S. D.

B. C. COOK is superintendent of the cyanide mill of the Penobscot M. Co., near Deadwood, S. D.

F. C. COOLEY, representing the Baker & Adamson Chemical Co. of Easton, Pa., is in San Francisco, Cal.

E. J. BONSTELL, of Sutter Creek, is now mill foreman of the Mount Jefferson mill at Groveland, Cal.

F. EARLS has returned to Salt Lake City, Utah, from an examination of mining property at Pioche, Nev.

W. G. BRILL, a Nome, Alaska, miner, has returned to his home at Mount Bullion, Mariposa county, Cal.

W. J. LAWRENCE, manager of the

Scottish Chief mine at Park City, Utah, is in New York on business.

H. C. JONES of New York, vice-president and superintendent Manhattan-Tonopah M. Co., is in Butler, Nev.

J. LANGFORD has resigned as superintendent Sheep Ranch mine, at Sheep Ranch, Calaveras county, Cal.

W. THOMPSON, general manager Roseland-Kootenay Co., has returned to Roseland, B. C., from London, Eng.

J. MCCHRISTAL, superintendent of the Gemini M. Co. at Eureka, Utah, is in Salt Lake City, Utah, on business.

G. B. HALLORAN, superintendent Woodenhoft properties on Smith creek, near Thunder, Idaho, is at the mines.

R. ANDERSON, superintendent British Columbia mine, Greenwood, B. C., has returned from a trip to Vancouver, B. C.

R. J. GROSS, vice-president America Locomotive Co., sailed from San Francisco for Siam on the Sierra on the 10th inst.

GENERAL MANAGER W. A. FARRISH of the Majestic Copper Co. has returned to Salt Lake City, Utah, from Arizona.

MANAGER E. T. HOLLIDAY of the Frontier Exploration Co. is at the mines near Cerbat, Ariz., from Redlands, Cal.

W. T. STEPHENS, superintendent Pinon Blanco mines, near Coulterville, Cal., is in San Francisco, Cal., on business.

MANAGER J. DOPP of the New York-Tonopah M. Co. returned last week to Butler, Nev., after an extended trip East.

E. & L. POAGE have gone from Grass Valley, Cal., to Chemulpo, Korea, to build a dam and flume for the Oriental Con. M. Co.

W. L. LANDUS has been elected recorder and C. L. Richards secretary of the Tonopah mining district at Butler, Nev.

J. FARREN, superintendent of the Glasgow & Western Exploration Co.'s mines at Golconda, Nev., is in Salt Lake City, Utah.

J. M. DIKEMAN, of Lawton, Oregon, left last week for Rhodesia, South Africa, where he takes charge for a London company.

R. E. OBER, superintendent Beatrice-Robles mines, near Murphys, Calaveras county, Cal., has returned from a business trip East.

A. W. MCCUNE, manager Cerro de Pasco mines, Peru, South America, has returned to Cerro de Pasco from Salt Lake City, Utah.

P. CLARK, president of the Republic Con. M. Co., has returned to Spokane, Wash., from a trip to their mines at Republic, Wash.

J. W. MCCANN, lessee of the North San Poil mine, near Republic, Wash., has returned to Republic from a business trip to Nelson, B. C.

J. A. CZIZEK, manager of the Lost Packer mine on Loon creek, near Custer, Idaho, is visiting the mine from Salt Lake City, Utah.

J. E. BEVERIDGE is superintendent of the Dixie mines of the Utah & Eastern M. Co., near St. George, Utah, vice G. Snyder, resigned.

J. M. THOMAS, manager Fremont-Vineta Oil & G. M. Co., has returned to Breckenridge, Colo., from a directors' meeting in Chicago, Ill.

B. BENTON, of Bay City, Mich., who has large interests in the cement works at Tolinas Springs, Solano county, Cal., is in San Francisco, Cal.

DANA HARMON, E. M., has returned to San Francisco, Cal., from an extended tour of the mines in the Rocky Mountain region, recently in Colorado.

THEO. F. VAN WAGENEN, of Sallisbury, Rhodesia, S. A., is conducting a mine-exploration trip through Transvaal, Natal and Cape Colony, S. A.

R. H. TERHUNE, manager of the Iron Dyke M. Co., in Seven Devils district, Idaho, returned last week to Denver, Colo., from Baker City, Or.

J. T. PENDEGAST and G. N. MCCOLLOUGH, vice-president Prescott-Arizona G. M. Co., Prescott, Ariz., are in the East on business for the company.

C. E. ANDERSON, engineer for Taylor & Brunton of Denver, Colo., has been in Sonora, Mexico, looking after mining interests, and is now at Cananea.

SECRETARY L. G. LILLEY of the Baby McKee G. M. Co. of Cincinnati, O., is superintending operations at their Last Chance mine, near Sumpter, Or.

A. CASE, formerly superintendent of the Cornucopia mines of Oregon, manager

of the Canadian Lead Co. of Montreal, is in London, Eng., on mining business.

F. DAVIS, formerly metallurgist at Rawhide and App mines, Tuolumne county, Cal., is now manager Yaqui S. & R. Co. at San Antonio De La Huerta, Sonora, Mexico.

P. S. DAVIS of Gatton, Australia, who has been near San Marcial, Sonora, Mexico, the past three months, is now in New York. Mr. Davis represents the Davis Calyx Drill Co.

G. SNYDER has resigned as superintendent of the Dixie mines of the Utah & Eastern M. Co., near St. George, Utah, and has accepted the position of assistant manager of the Western Exploration Co.

E. H. LITTLE, formerly manager of the Colorado River G. & C. Co. and of the Papago M. Co., has been appointed fiscal agent of the Friday Guich G. M. Co., whose mines are at Havilah, Kern county, Cal.

CHAS. B. GIBSON has returned to Chicago from an extensive trip through Sonora and Sinaloa, Mexico, after having examined and reported on six gold, silver and copper mines for the International Copper & Gold Co. of Chicago.

W. B. FISHER, general manager of the American Zinc, Lead & Smelting Co., of Carthage, Mo., has resigned and has gone to Colorado Springs, Colo., where he will reside during the summer. Mr. Fisher has had the management of the American Co.'s properties for the past four years.

Recent Geological Survey Publications.

One of the most interesting and useful topographic maps published by the United States Geological Survey is the Cœur d'Alene special map now in press and will shortly be issued. The map is drawn on a scale of approximately 1 inch to the mile, and represents with great accuracy the topographic features of the Cœur d'Alene mining region in Idaho. On it are shown the locations of Bunker Hill and Sullivan mines and the Last Chance mine at Wardner; also the Hecla, Standard and Wardner mines at Burke, the Gem and Helena Frisco mines at Gem, and the mining interests located near Mullan. In addition to these larger mines the locations of all of the smaller prospects throughout the region are indicated, as well as the placer prospects in the Prichard creek region, a few miles farther north.

There is also a topographic map of the Santa Susana quadrangle, embracing portions of Los Angeles and Ventura counties, Cal. On it will appear parts of the Pine mountains and Zaca lake forest reserve, the Santa Susana mountains, and the northern side of San Fernando valley. It will show the region near the headwaters of the Santa Clara river and that portion of the Santa Susana mountains whose drainage is to be utilized for the municipal supply of Los Angeles.

The topographic map of the Dahlonega quadrangle in Georgia, covering all of White and Towns counties, and portions of Union, Lumpkin, Habersham and Rabun counties is also in press. The region is of special interest, as it includes the Dahlonega section, one of the earliest and most valuable gold mining regions of the East. Here was located a United States mint, which remained in operation until 1861. Gold was first taken from the Chestatee river gravels and other deposits of the region by placer mining, and dredging the river bottom for gold is still practiced. Of late years deep mining has been resorted to in the surrounding hills, and large stamp mills and chlorination plants have been erected at Dahlonega.

The sheet also shows the region in which is the rich deposit of pyrite that was recently opened to supply material for the manufacture of sulphuric acid.

Obituary.

D. F. RHEINHARDT of Dillon, Mont., for several years superintendent of the Hecla Con. M. Co., at Hecla, and until recently manager of mining properties in Mexico, died at Dillon on the 4th inst. from a stroke of apoplexy. Deceased was born in Wurtlenburg, Germany, in 1845, coming to America in 1862. He leaves a wife and two daughters.

Books Received.

"Statics, hy Algebraic and Graphic Methods," is the title of a new work by Lewis J. Johnson, C. E. The book is intended for the use of students of engineering architecture. It deals with the solu-

tion of statical problems, stress in structures of various kinds, both framed and unframed. Both graphic and algebraic methods are employed in demonstration. The book is complete and profusely illustrated with graphic diagrams; 133 + VIII pages; 42 figures and 6 double plates; cloth, \$2. John Wiley & Co., New York and London.

Commercial Paragraphs.

THE Pelton Water Wheel Co. of San Francisco have the exclusive sale on the Pacific coast of the New American turbine wheel made by the Dayton Globe Iron Works, Dayton, O.

H. V. CROLL, manager Salt Lake City branch Allis-Chalmers Co., writes that after March 20 the Salt Lake City branch office will be located at 209-211 South West Temple street.

THE Mine and Smelter Supply Co. of Denver, Colo., has recently put two Dimick classifiers in the mill of the Ophir Con. M. Co. at Ophir, Colo., one in the mill of the Empire Zinc Co. at Canon City, Colo., and one in the mill of the Resurrection G. M. Co. at Leadville, Colo.

At a special meeting of the stockholders of the Brown Corliss Engine Co., in Corliss, Wis., Feb. 26, 1903, there were 7910.1 of all the outstanding votes cast either in person or duly authorized proxy, in favor of increasing the capitalization of the company from \$1,000,000 to \$1,200,000.

JOHN A. YEATMAN & Co. of San Francisco, Cal., hydraulic engineers and contractors, have opened up offices at No. 13 First street. They report shipping one Adams hydraulic lift to Ecuador, S. A., this week, and are preparing seven more for shipment to Alaska. They have also shipped a brass pump to the International Salt Co. for pumping brine.

THE Krogh Manufacturing Co. of San Francisco, Cal., report shipping to Texas for rice irrigation four of their "special California centrifugal" pumps, with capacities ranging from 30,000 to 35,000 gallons per minute, the orders being obtained in competition on guaranteed efficiency tests. They also have one of their cement gravel mining machines ready for shipment to the Feather River district, Cal.

THE Arizona & Sonora Manufacturing Co., Nogales, Arizona, employs between 75 and 100 men. They have a machine shop 50x90 feet, well equipped with the latest style and improved machines. The foundry is 50x90 feet, the pattern and forge shops each 50x50 feet. They are contemplating the erection of a large shop for the machine department. At present they are building a compound engine, 12x22x30, for the local electric light plant and have completed a 20-stamp mill for the Yerkes G. M. & M. Co. of Sonora, and have a large number of orders for ore cars and mining cages. E. Titcomb president, Charles Mix treasurer, W. E. Carroll superintendent. Roy & Titcomb are sales agents for the above company.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MARCH 3, 1903.

721,556	—NOZZLE—J. Bean, Los Gatos, Cal.
721,556	—REPAIR CAR—G. L. Bender, S. F.
721,557	—LUMBER REGISTER—W. G. Boswell, Sola-dag, Cal.
721,580	—WOOD SAWING MACHINE—T. M. Danagan, Noble, Or.
721,799	—FRICTION CLUTCH—M. G. Harris, S. F.
722,015	—BOTTLE—C. Hatley, Rialto, Cal.
722,103	—NEEDLE-AWL—B. E. Hevey, Ritzville, Wash.
722,034	—SWITCH—J. N. Ke'nan, Colgate, Cal.
721,725	—CONVEYOR—W. L. McCabe, Seattle, Wash.
721,819	—DOOR HANGER—J. F. Millerick, S. F.
721,820	—TRUCK—J. J. Moule, San Jose, Cal.
721,967	—ROOFING TILES—E. L. Quinn, Los Angeles, Cal.
721,747	—BUILDINGS—J. Roemer, Santa Maria, Cal.
721,969	—LEDGER—C. A. Schofield, Los Angeles, Cal.
722,155	—OIL BURNER—H. L. Sherwood, Oakland, Cal.
721,754	—REIN HOLDER—B. A. Smith, Tacoma, Wash.
722,156	—BEET TOPPER—C. Spreckels, S. F.
722,162	—SASH FASTENER—F. X. St. Louis, Colusa, Cal.
721,932	—PLANING FLOORS—Stephens & Goodale, Pasadena, Cal.
722,163	—OIL BURNER—W. J. Stoermer, Los Angeles, Cal.
721,759	—BOTTLE—H. Van Wie, S. F.
722,170	—BOTTLE AND BRUSH—Weher & Frey, Baker City, Or.
722,068	—STATION INDICATOR—P. J. Wilson, Ben Lomond, Cal.
721,850	—MEASURE—A. C. Wright, Berkeley, Cal.
721,990	—NUT LOCK—W. R. & G. W. Young, Stockton, Cal.

Latest Market Reports.

SAN FRANCISCO, March 13, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22s 10d (standard ounce, 925 fine); New York, bar silver, 49½¢, refined (1000 fine); San Francisco, 48½¢; Mexican dollars, 38 @39¢ San Francisco, 38½¢ New York.

COPPER.—New York: Standard, \$14.00; Lake, 1 to 3 casks, \$14.50@15.00; Electrolytic, 1 to 3 casks, \$14.50@15.00; Casting, 1 to 3 casks, \$14.50 @15.00; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @24¢. London: £64 5s spot per ton.

Concerning the present copper situation, a prominent Eastern authority is quoted as saying: "The present conditions are in no sense the outgrowth of manipulative tactics, but are purely the result of a steady-growing legitimate demand for the metal—a demand which I believe will reach unprecedented proportions. Neither the Amalgamated people nor any other interest are opposed to the present movement. Indeed there was, as everybody understands, a long period during which the metal situation appeared to be under a heavy hand; but that hand has now been removed and the market ought, as I believe, to go on expanding with the consumption steadily increasing until it shall have caught up with the extension that has characterized other lines of trade and industries during the past two or three years."

LEAD.—New York, \$4.37½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½¢ 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½¢; pig, \$4.75. London: £13 12s 6d per long ton = 2.75¢ per lb.

SPELTER.—New York, \$5.25; St. Louis, \$4.60; London, £23 0s per ton; San Francisco, ton lots, 6½¢; 100-lb lots, 7¢.

ANTIMONY.—New York, Cookson's, 9½¢; Hallett's, 8½¢; San Francisco, 1000-lb. lots, 10¢; 300 to 500 lbs., 11¢; 100-lb. lots, 13¢@15¢.

TIN.—New York, pig, \$30.55@30.75; San Francisco, ton lots, 32¢; 500 lbs., 32¢; 200 lbs., 32½¢; less, 33¢; bar tin, \$ ½, 35¢ @37½¢. London, £139 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ ½ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80¢ per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @ ½ flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10¢; No. 2, 7¢; No. 3, 6½¢; extra, 17½¢; genuine, 35¢; Eclipse, 37½¢.

ALUMINUM.—New York, No. 1, 99¢ pure ingots, 35¢; No. 2, 90¢, 30¢ to 34¢.

SOLDER.—Half-and-half, 100-lb. lots, 20¢; San Francisco, Plumbers', 100-lb. lots, 16.65¢.

NICKEL.—New York, 50@60¢ @ ½ lb.; ton lots, 45@48¢.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3¢ @ ½ lb., 3½¢ in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7¢ to 12¢ per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$24.00@24.50
Foundry Northern 1.....	23.00@24.00
Northern 2.....	22.50@23.50
Northern 3.....	22.00@23.00
Southern 1.....	23.35@23.85
Southern 2.....	22.85@23.35
Southern 3.....	22.35@22.85
Forge.....	21.85@22.35
Charcoal.....	26.00@27.00
Billets, Bessemer.....	33.00@34.00
Bars, iron.....	1.85@1.90
Bars, steel.....	1.75@1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, boiler.....	1.90@2.00
Tank.....	1.75@1.80
Sheets, 26 store.....	2.80@2.90
No. 27.....	2.90@3.00
No. 28.....	3.00@3.10
Angles.....	1.75@
Beams.....	1.75@
Tees.....	1.80@
Zees.....	1.75@
Channels.....	1.75@
Steel melting scrap.....	18.00@18.50
No. 1 railroad wrought.....	18.50@19.00
No. 1 cast, net ton.....	18.00@18.50
Iron rails.....	24.00@25.00
Car wheels.....	23.00@23.50
Cast borings.....	10.25@10.50
Turnings.....	14.25@14.50

CHEMICALS.—Cyanide of potassium, 98%-99%, johning, 25@26¢ @ ½ lb.; carloads, 24@24½¢; in tins, 35¢; soda ash, 22.00 @ ½ lb.; hyposulphite of soda, 24@25¢ @ ½ lb.; caustic soda, in drums, 3@4¢ @ ½ lb.

s. soda, hbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12@13¢; nitrate of potash, hbls., 8¢; caustic potash, 10¢ in 40-lb tins; borax concentrated, 7@8¢ @ ½ lb.; roll sulphur, 4@6¢; powdered sulphur, 2@3¢; flour sulphur, French, 2@3¢; alum, \$2.00@2.25; California refined, 2@2½¢; sulphide of iron, 9¢ @ ½ lb.; copper sulphate, 5@7¢; chloride of lime, spot, \$3.00@4.00; sulphuric acid, in carboys, 66½¢, 2½¢ @ ½ lb.; nitric acid, in carboys, 8¢ @ ½ lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILES.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for car-load lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15¢; less than one ton, 17½¢. No. 1*, 60%, carload lots, 13½¢; less than one ton, 15¢. No. 1** 50%, carload lots, 11½¢; less than one ton, 13½¢. No. 2, 40%, carload lots, 10¢; less than one ton, 12¢. No. 2*, 35%, carload lots, 9½¢; less than one ton, 11½¢. No. 2** 30% carload lots, 9¢; less than one ton, 11¢. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½¢ @ set; 14 oz., 40s., 9½¢.

CEMENT.—Germania, \$2.50 @ 2 75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymho, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56¢; cs., 61¢; raw, bbl., 54¢; cs., 59¢; Lucol oil, hoiled, bbl., 50¢; cs., 55¢; raw, hbl., 48¢; cs., 53¢. Kerosene—Pearl, per gal., 22½¢; Astral, 22½¢; Star, 22½¢; Extra Star, 25½¢; Ecocene, 24¢; Elaine, 27½¢; Water White, in bulk, 16¢; Mineral Seal, iron bbls., 18½¢; wooden bbls., 21¢; cs., 24¢; Mineral Sperm, cs., 26½¢; Deodorized Stove Gasoline, bulk, 17¢; do., cs., 23½¢; 86° Gasoline, bulk, 21¢; do., cs., 27½¢; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16¢; do., in cs., 22½¢; c. Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75¢; cs., 80¢; Sperm, crude, 50¢@60¢; Natural White, 65¢; Bleached do, 70¢; Whale Oil, cs., 50¢@55¢.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½¢; less than 500 lbs., per lb., 6½¢; in 25-lb. tin pails, 4¢ per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4¢ per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6¢; do. in kegs, 6½¢.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., 6½¢.

LITHARGE.—Pure, in 25-lb. bags, 8 @9¢ per lb.

BONE ASH.—Extra No. 1, 5@6¢ per lb. No. 1, 4@5¢.

BORAX.—Concentrated, 7@9¢ per lb. powdered, 9@12¢; fused, 25@30¢.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4¢ @ ½ lb.

BORAX.—Crystal, 7¢; calcined, 25¢.

COPPER.—Sulphate, 5@7¢.

MANGANESE.—(90% and over) @ ½ lb., \$1.25.

MOLYBDENUM.—25¢ @ ½ gramme; 1000 grammes=2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, @ ½ lb., \$1.25.

MERCURY.—Bichloride, @ ½ lb., 90¢.

PHOSPHORUS.—(American) @ ½ lb., \$1.00.

SILVER.—Chloride, @ ½ oz., 90¢@1.00; nitrate, 55¢.

URANIUM.—Oxide, @ ½ lb., \$3.50.

ZINC.—Metallic, chemically pure, @ ½ lb., 50¢; dust, @ ½ lb., 10¢; sulphate, @ ½ lb., .04¢.

(These prices are wholesale, f. o. h. San Francisco, unless otherwise noted.)

A PRACTICING PHYSICIAN AND SURGEON, in San Francisco, of excellent standing, desires a position as surgeon to a mine or mining company. Is a graduate of the University of California. Best of references given. Address Box 13, this office.

MINING AND SCIENTIFIC PRESS

Whole No. 2226.—VOLUME LXXXVI. Number 12. SAN FRANCISCO, CAL., SATURDAY, MARCH 21, 1903.

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Life of Mine Timbers.

When timbers are placed in underground workings of mines the life of these timbers is somewhat speculative, and not always easy of determination. There are many things, aside from crushing and destruction by blasting, which have a direct influence on the life of timbers. Important among these are the amount of moisture in the atmosphere of the mine, together with the temperature, ventilation, etc. A hot, moisture-laden atmosphere rots pine timbers with a rapidity that is sometimes astonishing. If, however, the same timber is placed in a position where it is perpetually wet, not with the moisture of the atmosphere, but with running water, or entirely beneath the water, its life is greatly prolonged, and it may endure for years if not crushed by pressure.

The condition and kind of timber is itself important. Pine, spruce, etc., cut in the winter months, when the sap is down, will last very much longer than that cut in spring. In fact, sap-laden timbers are expensive at almost any cost, as a few months is all that may be counted on after being placed underground.

The butts of logs often give a fair index of the probable relative life of pine timbers. Those having narrow rings, and a firm solid appearance, will be found to far outlast those having wider rings with a soft, porous texture. Spruce timbers are usually more serviceable than either yellow or sugar pine. When placed in the same sets, where the conditions are practically uniform as affecting timbers, in a humid atmosphere, the pine timbers will quickly become covered with white fungi, and in a few months decay will have proceeded so far that only the heart of the timber will be serviceable, while spruce timbers, put in at the same time, are still in a good state of preservation, though spruce timbers will not stand as great a crushing load as pine, nor has it as great strength to resist cross fracture.

Oak timbers endure longer than any of the cone-bearing species of timbers, but owing to its high cost and the inability to obtain it at all in most places, oak is not used extensively in mining operations. It is more expensive to frame also. In California red-

wood has been employed extensively as mine timber at the New Almaden quick-silver mines, and has proven satisfactory there. The timbers are all sawed, usually of large size, and are often placed in the mine double, being bolted together. That is, two posts are employed where usually but one is found, etc. As redwood is cheaper than pine at this mine, and as the timber does not rot out, it seems well suited to use in mines having hard ground that stands fairly well without timber.

In Australia the eucalyptus has been extensively used in some districts, and is reported as being satisfactory. It is better in the form of round sticks than as sawed timber, owing to the "twist." No timber should be placed in mines without first removing the bark, and the timber should also be well seasoned. It has been observed in some of the hot, humid workings of mines in Amador county, California, that timbers placed directly in line with the current of air passing through a



Crown Mica Mine, Custer, S. D. (See page 181.)

stope were much more seriously affected by decay than similar timbers placed a few feet distant, but where the direct air current did not strike them.

The longevity of mine timbers is a subject given only passing attention by mine superintendents, as they are usually calculated to last only a comparatively short time; but the fact that timbers frequently require renewal, by reason of decay, suggests the necessity of either a more careful selection of timber or a change in methods of mining, which will place less dependence on the timbers for permanent support.

Though there are a number of preparations which answer admirably in preserving timbers, these are not in general use at mines for the same reasons as those already given, although it is not uncommon to treat timbers placed in sills and in the first few sets near the collars of shafts to prevent surface decay or dry rot.

The kind of timber selected by mine managers is ordinarily determined by the first cost—those obtainable at the lowest price which appear suitable as to size and condition are generally the ones bought and used in the mines, though it is questionable whether this is always in line with the strictest ultimate economy.

THE Oregon Legislature has passed a law fixing a license tax on new incorporations in that State, which will have a direct effect on new mining corporations. Under the provisions of this law, beside the original tax upon incorporating, there will be an annual tax. The amount of tax is determined by the capitalization. The probable effect of this law will be the limitation of capital stock in new mining corporations to much smaller amounts than is usually adopted.



Rotary Kilns, Cement Works, Tolenas, Cal. (See page 180.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page
Crown Mica Mine, Custer, S. D.....	177
Rotary Kilns, Cement Works, Tolenas, Cal.....	177
The Ball Mills, Cement Works, Tolenas, Cal.....	180
Machine Drilling in Stopes.....	181
Tramway Terminal at Smelter, Encampment, Wyo.....	182
Shaft House, Haggerty Mine, Encampment, Wyo.....	182
Dam in Course of Construction, Encampment River, Wyo.....	183
Double Tension on Tramway, Encampment, Wyo.....	183
Longitudinal Vertical Section, Wolverine Mine.....	185
Map of Keweenaw Point, Mich.....	185
Weinland Boiler-Tube Cleaner.....	185
Mining and Metallurgical Patents.....	186
EDITORIAL:	
Life of Mine Timbers.....	177
A License Tax on New Incorporations.....	177
Private vs. Corporate Management.....	178
Labor Troubles in Mines.....	178
In Aid of Mining.....	178
MINING SUMMARY.....	187-188-189-190-191
LATEST MARKET REPORTS.....	192
MISCELLANEOUS:	
Concentrates.....	179
Manufacture of Portland Cement in California.....	180
An Advance in Lead.....	180
The Crown Mica Mine, Custer City, S. D.....	181
Machine Drilling in Stopes.....	181
Tailings at Ely, Nevada.....	182
High Benches of the Nome Gold Fields.....	182
Gold and Silver Output of South America.....	182
N. A. Copper M. Co.'s Aerial Tramway, Grand Encampment.....	182
Pyritic Smelting.....	183-184
Copper Mining in Upper Michigan.....	185
Boiler-Tube Cleaner.....	185
Mining and Metallurgical Patents.....	186
Personal.....	191
Commercial Paragraphs.....	191
Obituary.....	191
New Patents.....	191
Notices of Recent Patents.....	191

Private vs. Corporate Management.

Not infrequently mines which were known to have paid a satisfactory profit under the ownership and management of private interests, upon passing to a corporation, cease to be dividend payers; and, again, similar instances are of record wherein mines operated at a loss under corporate management, after an idleness of several years, finally become private property, and enter upon a career of prosperity for the first time in their history. Naturally an explanation of the causes for this difference in private and corporate management is sought, and may usually be found.

Where this interesting example has occurred, upon investigation it will usually be found that under private ownership the management, if not scientific and technical, was, at least, thoroughly practical; and often, too, it will be observed that the operations were conducted on a less elaborate scale. If a 60-stamp mill were an attachment of the property under the corporate management, but five or ten stamps, or possibly twenty, were run under private ownership. Less ore was broken by the latter, but that from the pay streak or zone of better grade, and no attempt made to handle large quantities when every portion of the rock mined and milled did not pay at least the expense of mining and treatment. This is sacrificing a large output with more or less ostentatious display, to quiet, business-like management, and practical application of mining and business methods.

Then, too, under private ownership there are usually fewer officers, and salaries are often somewhat lower. There are no ornamental figureheads, who do nothing but draw their salary; no elaborate turn-outs, emblazoned with "coats of arms; plain, practical men and methods take the place of display and incompetency, and the saving thus effected represents the difference between success and failure. It may be said that in some cases where men are competent to handle a small property successfully, that they lack the technical knowledge and skill and business ability to successfully manage a large mine where the mining and metallurgical conditions re-

quired the highest engineering and technical experience. While this in some instances may be true, it is also true that a property of the latter class will usually, still less than a more ordinary property, justify the extravagance of incompetent management.

Large low-grade mines, to insure a profit, must have the most careful management, and the maintenance of two or more elaborate offices, with their large incidental expense, added to similar unnecessary expense at the mine, usually means failure, and this the private management dispenses with entirely. This principle also applies to the leasing system and offers an explanation of why leasers can sometimes make a mine pay which has proven a failure under corporate ownership and management.

Labor Troubles in Mines.

Industrial conditions in the United States are being disturbed by widespread conflict between capital and labor. In the mining industry particularly is this unsettled condition of affairs noticeable. In many mining States the miners are organized. It is not strange that mine owners and managers do not always promptly comply with the demands made by the unions. In some cases requests made by the miners just and reasonable are granted, and they have gained their point without a strike, or other demonstration; in other instances the demands are unbusinesslike and unreasonable, and have been met by prompt and flat refusal on the part of the management. In these instances a strike has generally resulted. A notable instance is that at the Golden Reward smelters at Deadwood, South Dakota, where several extra men were employed on extra work, which, having been completed, the men were paid off and discharged, there being nothing further for them to do. The union demanded their reinstatement, which was refused by the management, a strike resulting, followed by a shut down of some of the company's mines. A demand like that instanced is simply the outcome of ill-advised leadership.

Many of the troubles between mine owners and the labor organizations have been over recognition of the unions. They have demanded the discharge of non-union men, and when this has been complied with have in some cases refused admittance of the discharged men into the union, thus practically depriving them of an opportunity of making a living.

An instance of this is found in the trouble at Keswick, Cal., which has been going on for several months, practically paralyzing the mining industry of that part of California. In that district the citizens have taken sides with the Mountain Copper Co., thereby indicating their disapproval of the action of the union in this matter.

In some districts the boycott has been and is now employed in furtherance of the demands of the union laborers. In the Cripple Creek, Colo., district, may be found an instance of this phase of the labor trouble. The miners have required of mine owners that they shall not ship ore to the Colorado City reduction works, where the workmen have struck for higher wages and shorter hours. In this case the State militia has been called out. The unions claim a victory thus far in the matter, having secured the promise of a number of mine managers not to ship ore to the Colorado City mills. A number of mines have shut down in Cripple Creek district as a result of this difficulty, over 600 men being out of work in addition to those at the mills.

On March 18, in San Francisco, Cal., a large number of California mine owners and managers met to organize an association for the purpose of preventing, as far as possible, those constantly arising troubles between the miners and their employers, and for adjusting those difficulties when they do occur. This movement originated in the organization in Amador county, Cal., in 1901, of a local mine managers' association, with a similar purpose in view. At that time a miners' union was projected, being started ostensibly as a benevolent fraternal organization, but the real purpose of the organization was the unionizing of Amador county miners. Many years ago a miners' union was organized there, and a peaceful, prosperous district soon after became a scene of riot and bloodshed, which was finally quelled by troops. The present operators, having this incident in mind, and not caring for a repetition of similar scenes, organized for self-protection, and

the unionizing of Amador county apparently came to a standstill; but more recently members of the Western Federation of Miners have been in that section and have succeeded in forming a union. At Hayden Hill, in northern California, within a fortnight, a union has been organized by the same Federation.

In California, where mining has been actively carried on for over fifty years, the rich superficial portion of the veins and the placers have mostly been long since exhausted, and mining in that State is now carried on at great initial outlay and constant heavy expense, with returns not more than satisfactory, and, in some cases, at a loss, and, in some cases, it has become rather a matter of existence than of large profits in mining. In view of mutually existing conditions between operators and employes, which for years past seem to have been satisfactory, and the knowledge that any material increase in expense will prove a hardship which the mines will generally be unable to meet, the California mine owners have decided to seek protection by organization.

In British Columbia, for some months past, a number of the most important coal mines have been closed by miners striking for increased pay and shorter hours. At Nanaimo the management of the Wellington mines have closed some of their properties upon learning of a desire upon the part of their men to join the Western Federation of Miners. Over 1000 men are there affected.

The industrial discontent that is making itself so universally felt affects the general public as well as the employers, employes and special interests of the industry affected. The natural law of the business world assumes such complex relations that a strike in the coal mines of British Columbia affects London and the Argentine Confederation; a "walk out" in a Colorado gold mill has far-reaching consequences in Eastern railway movements; a shut down in a California mine upsets a project of South African investment; a tie up in an Idaho mining camp determines the fate of a proposition in Ecuador. While true of all enterprises, this is particularly manifest in anything affecting the great basic industry of mining, which is the corner stone of national prosperity, and hence anything that affects the continuous operation of mining anywhere has instant hearing on all projects that depend for their progress thereon.

In Aid of Mining.

The California Legislature, during the session just closed, made two appropriations in the interest of mining, one of which is that of \$56,000 for the maintenance of the State Mining Bureau for the ensuing two years. This appropriation is smaller than any that has been made for several years past, and is not commensurate with the importance of the mining industry in that State. The appropriation is divided into four sections, viz: \$6000 salary of State mineralogist, \$10,000 geological and other field work, \$40,000 to maintain the office and museum in San Francisco and \$10,000 for printing the publications of the bureau. A bill was also passed authorizing the sale of the bureau reports at cost of printing, which will increase the available funds about \$100 per month, or \$2400 during the two years' term, which may, in the discretion of the trustees, be applied to the geological fund.

As the field assistants usually receive \$150 per month and expenses in the field, the funds available will not admit of more than two field men being employed continuously, with the occasional employment of one or two others. In consideration of the large field to be covered, the fund available for the purpose seems very small.

The other appropriation referred to is that of \$130,000 for the purpose of making a State exhibit at the Louisiana Purchase Exposition at St. Louis, Mo., and of this, \$25,000, it is understood, is to be devoted to making a mining exhibit, of which branch the California State mineralogist is to have the direction. For a similar purpose the Colorado Legislature has appropriated \$50,000. Mining States should show an active interest in this exhibition, as it cannot fail to attract the attention of capital to the mining industry, and miners individually can assist their district and State by aiding, as far as possible, the commissioner, when called upon, in the preparation of a representative exhibit.

CONCENTRATES.

THE pan or born spoon test is not always satisfactory or conclusive in testing gold rock, for sometimes the gold is so fine as to be invisible to the eye.

IN laboratory practice 130 parts by weight of cyanide will dissolve 196.8 parts of gold; in commercial practice 30 to 40 parts are required to 1 part of gold in solution.

WITH an inch nozzle it would take 125 feet head of water to throw a stream of water 100 feet high. Under such pressure about 200 gallons per minute would be discharged.

A CUBIC FOOT OF WATER contains $7\frac{1}{2}$ gallons and weighs 62 $\frac{1}{2}$ pounds. A gallon contains 231 cubic inches and weighs 8 $\frac{1}{2}$ pounds. A cubic foot of sea water weighs 64.31 pounds.

GOLD is slightly lighter than platinum, the former having a specific gravity of 19.33 when pure, and the latter of 21 to 22 when chemically pure, though ordinarily from 14 to 19, owing to impurities.

THE Tonopah, Nev., ore in numerous cases shows that 1% of the money value of silver in the ore is equal to the number of ounces gold. Much of the Tonopah ore treated in the smelters has carried \$150 in silver and 1 $\frac{1}{2}$ ounces gold to the ton.

THE horse power necessary to elevate water to a given height is found by multiplying the total weight of the water in pounds by the height in feet, and divide the product by 33,000. An allowance of 25% should be made for friction in pipe line.

THE process of treating black sand for gold has been repeatedly published. To separate gold chemically attached to magnetic or non-magnetic iron sand, one way is to pulverize the iron ore, ilxviate, leach it, concentrate, and treat the concentrates.

AT an altitude of 10,000 feet 26 $\frac{1}{2}$ pounds of water entering a condenser at a temperature of 60° F., and returning at a temperature of 100° F., would be required to condense one pound of steam exhausted into the condenser, the vacuum gauge reading 14 inches of mercury.

TAKING the legalized standard miners' inches of water as fixed by the California State Legislature, at 1 $\frac{1}{2}$ cubic foot per minute, an inch of water under 410 feet head will develop about 1 H. P., or correctly, .99027 H. P. For greater quantity of water multiply by number of inches available.

THE aneroid barometer can be employed for reconnaissance, on ditch lines, railway surveys, proposed roads, etc., but it is subject to so many variations that it cannot be depended upon, ordinarily, for accurate work without numerous corrections for temperature, daily variation, etc. The first inch above sea level is equivalent to about 917 feet.

THE temperature at the bottom of Tamarack shaft No. 5, near Houghton, Mich., at a depth of about 5000 feet is 87° F. In this shaft the temperature increases on an average 1° for each 112 feet in depth, which appears to be uniformly the case with all the mines of that district. Underground temperature in mines is greatly affected by local conditions.

FRICTION in pipes in the flow of liquids increases very nearly as the square of the velocity, and inversely as the diameter of the pipe. With new wooden pipes the friction is 1.75 time greater than in iron pipes, but after a time the interior of wooden pipes becomes coated with a film of silty ooze and the friction is greatly reduced, in some instances to less than that in steel or iron pipes of same size.

TAILINGS which have accumulated on unoccupied government land may be appropriated as placers by a citizen of the United States, and they then become the exclusive property of the locator. Tailings run upon the land of another become the property of the owner of the land. If the tailings damage the land or inconvenience the owner of the land, the owner of the mill is responsible for such damage.

QUICKSILVER in the form of sulphide of mercury is not a new thing at Mercur, Utah. Indeed, it was the ore of mercury, crudely worked, that made Mercur first known in its first name of Camp Floyd district. In the Sacramento mine the dull grayish substance from which the mercury sweats out upon application of heat goes \$250 per ton quicksilver and \$8 gold. A Scott furnace is the most usual form of treatment.

AS TO the advisability of an alarm bell in the hoisting engine room, which rings when the skip or cage approaches to within 50 feet of the collar of the shaft when hoisting, there is a difference of opinion. Some believe it to be a safeguard to overwinding, and others contend that in the event of failure of the bell to ring the engineer, being unguarded, is more likely to overwind than not. A hoisting engineer occupies a responsible position

and should trust no uncertain device to determine the position of the skip or cage in the shaft, but should watch his indicator and also have a suitable "tag" on the rope to warn him of the approach of the skip. It is always advisable to slow up on approaching the stopping place, at the surface or bottom of the shaft or at one of the levels.

THE indicated horse power of single-cylinder engines may be determined as follows: The I. H. P. equals the effective pressure in pounds per square inch times the length of stroke in feet, times the area of piston, times the number of strokes per minute, divided by 33,000. For accuracy one-half the sectional area of the piston rod must be subtracted from the piston area if the rod pass through one head, and the whole area if it pass through both heads.

GRAPHITE when pure is composed of pure carbon, like diamond. At very high temperature it burns more readily than diamond, but most varieties are less easily burned. It is infusible, has a hardness of 1 to 2, color iron black, luster metallic, sometimes dull and earthy, streak metallic; occurs in beds, imbedded masses, in veins and as scales in granite and schistose rocks; a common product of blast furnaces. It contains no lead. The name black lead is common, but is a misnomer.

THE time within which action should be commenced for underground trespass has been discussed at length. The general consensus of legal opinion seems to be that the time when the statute of limitation shall commence to run shall be upon the discovery of the trespass by the injured party. The Supreme Court of Pennsylvania has established a precedent in saying, "We are disposed to hold that the statute runs against an injury committed in or to a lower stratum from the time of actual discovery, or the time when the discovery was reasonably possible."

CHROME ORE is chiefly used for manufacture of chromates or ferro-chromium, or the metal chromium. It is also the source of a reverberatory furnace lining. Buyers seek a minimum content of 50% chromium sesquioxide. It is this required percentage that hinders the profitable working of some deposits, as well as general demand, freight and treatment charges. A high percentage of silica is also a deterrent. Chromite ore will carry alumina to 19%; ferric oxide 18% to 38%; magnesia to 18%; silica to 10%; chromic sesquioxide 39% to 66%. There is plenty of the ore in California and it has been mined, but usually unprofitably, Canada and Asia Minor mostly supplying the demand.

IN the case of Jackson vs. Roby, 109, U. S., 440, the Supreme Court of the United States held that "it often happens that for the development of a mine upon which several claims have been located, expenditures are required exceeding the value of a single claim, and yet without such expenditures the claim could not be successfully worked. In such cases it has always been the practice for the owners of the different locations to combine and work them as one general claim, and expenditures which may be necessary for the development of all the claims may then be made on one of them. * * * In other words, the law permits a general system to be adopted for adjoining claims held in common, and in such case the expenditures required may be made or the labor be performed upon any one of them."

TABLES giving the properties of saturated steam, that is heat, pressure, latent heat, etc., will be found in Porter's steam engine indicator, which tables have been widely accepted by American engineers as correct. Similar tables are found in Kent's mechanical engineers' pocket book. The apparently wide difference between the horse power indicated in Pelton's water wheel catalogue and results obtained at Ymir, B. C., are due partly to an error in reading the table. A 6-foot wheel under 600 (not 400) feet head, and employing a 4-inch nozzle requiring 685 2 miners' inches of water, generates 992.65 H. P. A 6-foot wheel under 400-feet head, employing 559 35 miners' inches of water, will develop 540 35 H. P. With a smaller nozzle and other buckets than the standard for that size of wheel will develop much less than this amount of power.

WHEN by reason of failure to perform the required assessment work on a mining claim the location becomes vacant under the provisions of the law, there is no forfeiture until a second party locates and appropriates the claim. When this has been properly done the domination and control over the property pass to the latter, and thereafter the relocater is clothed with the exclusive right of possession and enjoyment of all the surface included within the lines of location (Revised Statutes, Sec. 2322). It is the general law that all improvements of any character upon public lands of the United States pass to the purchaser from the Government (Collins vs. Bartlett, 44 Cal., 371; Pennysbocker vs. McDougal, 48 Cal., 163) and the relocater holds his estate by purchase. One cannot set up equities in improvements against the Government, or a purchaser from it, and State statutes which permit their removal after the land has passed into private ownership are void. It has been frequently held that machinery, such as engines, boilers, hoisting works, mills, pumps, and things of a like character, annexed to the soil for mining, becomes part of the freehold (Merritt vs. Judd, 14 Cal., 60), and as such they will pass to the relocater. The machinery so acquired cannot be

claimed as improvements when application for patent is made. While the above applies to machinery, buildings and like improvements, ore dumped on Government mineral land likewise becomes the property of a locator who takes up the land on which the ore has been placed in the same manner that tailings may be taken by whoever may claim them when on the public domain.

TO ASCERTAIN the number of cubic feet of water flowing in a stream or ditch per minute select a place along the ditch or stream that is as nearly straight as possible for a distance of about 300 feet. Measure carefully the width of the stream at a number of places, say every 30 feet. Also measure the depth of water across the ditch at each of these places, taking several measurements to ascertain average depth. Then drop a float in the water midway of the stream and note the number of seconds it requires to travel a given number of feet. Then multiply the average width of the stream by the average depth, as determined by measurement, and multiply this product by the number of feet traveled by the float per minute. This will give the cubic feet of water passing per minute. Divide the product by sixty to ascertain the quantity per second.

IN reference to the number of placer claims that may be taken by a single individual, Lindley on Mines says: "It is a matter of frequent occurrence that an individual locator, desiring to obtain more ground than he is permitted under the law to appropriate in his individual capacity by a single location, resorts to the use of 'dummies,' and perfects locations in their names, subsequently obtaining conveyances therefor. The courts have held that this is a fraud upon the Government. The same object can be accomplished without violating the law. There is nothing to prevent a miner from locating, by separate location, as many 20-acre tracts as he pleases, either contiguous or non-contiguous. The right to locate and develop mining ground is not limited to a single location, as in the case of pre-emption and homestead entries. Where an association of eight persons takes a tract of 160 acres (the limit of one company claim) the same company may locate another 'company claim' of 160 acres. The work may be done in a single place for the group of company claims, but \$100 must be expended for each claim or area of 20 acres. Thus a company claim of 160 acres requires the expenditure of \$800."

THE mineral colemanite is the principal source of borax in California at present. Colemanite is a compact, to crystallized, sometimes earthy mineral, usually white or milky, sometimes transparent, hardness 4 to 4.5, gravity 2.42; luster vitreous to adamantine. It is a composition of boron trioxide and lime, and is commonly known as calcium borate. It was first discovered in Death valley in Inyo county, Cal., and later near Calico silver mines, where a large vein-like deposit has been worked for ten years or more. This deposit is included in shales and sandstones, being conformable with the enclosing rocks, and outcrops along the surface where the formation has been folded, and the upturned edges eroded. It dips southerly at 45° near the surface, but becomes flatter in depth. It is the result of crystallization of calcium borate deposited on the muddy floor of a tertiary lake bed. This deposit was subsequently covered by detritus accumulating in the lake and was finally brought to the surface by dynamic disturbances. The deposit has been worked to a depth of 400 feet. In depth the vein is faulted. In width it varies from a few inches to 12 feet or more. The outcrop extends a distance of 5 miles or more in an east-west direction. Near Calico, and also in the vicinity of Daggett, the mud shales have been found to contain calcium borate, and development work has been done at several places, and small quantities of boracic acid made by the claim owners on an experimental basis.

FULLER'S EARTH is a name given to a siliceous earth that has the property of removing from newly made cloth the oil which has been employed in rendering the wool pliable in weaving. This is called "fulling." It is the physical properties and not the chemical composition that constitutes Fuller's earth. The properties by which it may be distinguished are an unctuous or soapy feel, with no grit that could injure the cloth when rubbed; fine texture, and when placed in water swells up somewhat, cracks and crumbles into a mass of incoherent fine sand. It is not plastic and can not be moulded like clay, and unlike most clays, it exfoliates when burned, and cannot be used in brick making. Among other uses it is employed in filtering oils, and to some extent in lightening the color of cotton-seed oil, although for this latter, and for other vegetable oils, the English earth is preferred. The crude, black mineral oil is allowed to percolate slowly through the dry, finely ground earth placed in cylinders, whence it issues nearly colorless, and at first somewhat thinner. The oils apparently percolate at different rates, according to their densities, and it is suggested to make use of this fact for the fractional separation of crude oils into their various qualities instead of distilling. Fuller's earth usually occurs in shallow basins in swampy tracts. Below this 2 feet of surface soil is a layer of plastic, mottled clay from 2 to 6 feet thick, beneath which are the layers of Fuller's earth from 2 to 12 feet thick, above a bed of sand. After being dug out it is allowed to dry in the sun for several days, during which it loses about 50% of its weight, turning from a greenish to a creamy-white color.

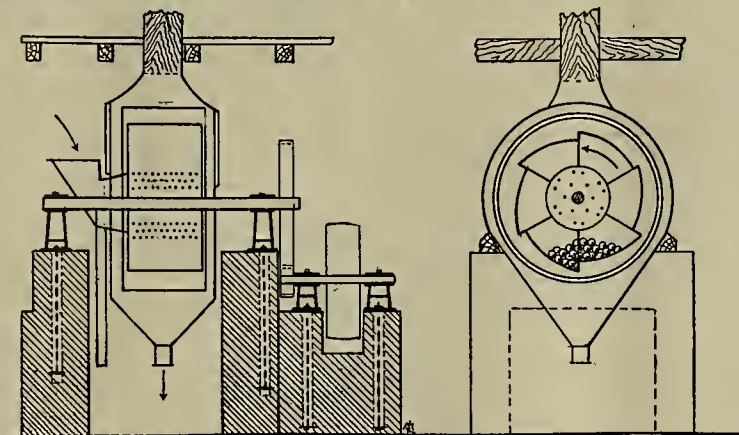
Manufacture of Portland Cement in California.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS
by R. P. McLAUGHLIN.

Previous to 1862 natural cement, a mixture of lime and clay, burned in a lime kiln, was used on the Pacific coast. In that year the first Portland cement was brought to San Francisco, but could not be sold.

An interesting comparison of such a state of the cement business and that at present existing is afforded by recent statistics compiled by C. G. Yale



Ball Pulverizer, Cement Works, Tolenas, Cal.

for the California State Mining Bureau. These show that in 1901 there were produced in California 71,800 barrels of cement, valued at \$159,842, the entire output being from the Colton works. Figures obtained from the Custom House show on imports of cement at San Francisco a duty of 7 cents per 100 pounds, or 28 cents per barrel.

The manufacture of Portland cement in California has been tried several times at different places, namely, Benicia, in Solano county, Antioch, in Contra Costa county, Jamul, in San Diego county, and Santa Cruz, in Santa Cruz county. The only plant at present producing in the northern part of the State is that of the Pacific Portland Cement Co. Since August, 1902, this plant has been manufacturing 600 barrels per day, and the plant is soon to be enlarged, giving a capacity of 1400 barrels. The mills of this company are situated at Tolenas, Cal., about 5 miles above Suisun, in Solano county, on the Southern Pacific R. R., and about equal distance from Suisun bay. All supplies and cement shipped go by rail, over a railroad about 2 miles long, from the works to the main line, built and operated by the cement company. The land owned by the company comprises about 800 acres. About 300 acres of this land consists of limestone and the remainder of clay shale—the only important ingredients used in cement.

Advantage is taken of the topography of the country to apply the principle of gravity, the works being situated on steeply sloping hills near the railroad. To the north, about three-fourths of a mile from the mill and at 200 feet greater elevation, lies the limestone quarry. About 100 yards to the east of the upper building, and slightly above it, is the bank furnishing clay. All the buildings, with the exception of one, the stock house, are built entirely of steel and sheet iron on concrete foundations set in the side of the hill. Every department in the plant is connected directly by telephone with the superintendent's office. Water is not abundant, but being needed only in small quantities for water jackets, a small surface reservoir and several wells supply the demand.

The only power used is electricity, brought 2 miles from the main line of the Bay Counties Power Co. Through an oil switch the current enters the main power house, containing the switchboards and transformers, at a voltage of about 45,000. The voltage is transformed to 2000 and again to 440 for all motors of less than 50 H. P. All motors are connected separately with the power house and cut out whenever they are not in use. The total power used is from 750 to 800 H. P.

The limestone used is a massive travertine deposited from calcareous springs, with bedding almost horizontal. The deposit is at the surface, stripping being unnecessary.

With outcrops and prospect shafts, a supply for a long period has been proven. An analysis by C. J. Wheeler, the company's chemist, shows the stone to be practically pure calcium carbonate, the composition being:

Silica (SiO ₂)	32%
Ferric Oxide (Fe ₂ O ₃)	49%
Alumina (Al ₂ O ₃)	56%
Calcium Oxide (CaO)	54.45%
Magnesium Oxide (MgO)	10%
Sulphuric Anhydride (SO ₃)	13%
Alkali (.00) and Ignition loss at red heat	43.71%
Total	99.76%

The sample having been dried at 212° F., the impurity which must in general be guarded against is magnesium, over 5% not being permissible in the cement.

The rock is removed from an open cut with a face of about 20 feet high and a length of 300 feet, being hand-drilled and shot down, workmen breaking up the stone and loading it in dump carts drawn by horses. When the face has been sufficiently straightened out, cars will carry the rock to the 50 H. P. Gates crusher near by, which crushes to 2-inch or under. The building covering the crusher and bin also contains the upper terminal of the rope tramway and a 10 H. P. motor operating it. A workman operates a gate on the crusher bin and allows the buckets of

of San Francisco bay. Composition of a sample dried at 212° F., according to Mr. Wheeler:

Silica (SiO ₂)	55.14%
Ferric Oxide (Fe ₂ O ₃)	7.15%
Alumina (Al ₂ O ₃)	19.15%
Calcium (CaO)	3.19%
Magnesium (MgO)	1.66%
Sulphuric Anhydride (SO ₃)	.66%
Alkali	2.55%
Ignition loss at red heat	10.35%
Total	99.85%

Iron is an impurity to be guarded against, one of its most harmful effects being that it imparts a burnt color to the cement, and, upon exposure, weathers out, giving the rusty stain. Most specifications limit the iron contents of cement to 5%. Another harmful impurity is sulphur, the effect of which is to retard setting. The maximum of SO₃ is 2%. Free silica, or sand, is to be guarded against; but a small percentage can be tolerated if the grains are very fine, allowing close mixture and perfect chemical combination.

Sea water added to Portland cement before setting tends to retard the process, owing to the presence of magnesium salts, and, consequently, where salt water must be used in mixing, a quick-setting cement is necessary.

A small amount of alluvial is stripped from the clay, which is then plowed deep and hauled out upon a platform by scrapers drawn by horses. A trapdoor in the platform allows the clay to fall into cars on the track beneath. There is a slight slope from the clay bank to the stone house, a distance of about 100 yards, and the cars run down by gravity, the empties being made into trains and hauled back by horses. Only about one-fifth as much clay is used as of limestone, and, consequently, the clay bank is worked intermittently and a supply accumulated upon the floor of the stone house. The quarry and tramway men work ten hours every day that the weather permits.

(TO BE CONTINUED.)

An Advance in Lead.

A recent advance in the price of lead has had a salutary and stimulating effect on mining in those districts producing lead ores. While this advance,



The Ball Mills, Cement Works, Tolenas, Cal.

unloading. At the quarry end the empty bucket, upon arriving, starts the one just loaded, and at the lower end of the system an empty car, on leaving the terminal, turns over the car behind it.

A 10 H. P. motor is connected to the tramway; but after starting only about 3 H. P. is necessary to maintain the motion. The longest single span is about 600 feet.

The bin into which the tramway discharges is situated in the stone house, or highest building, and the material in passing through the mill is almost continually falling to a lower level, power being consumed by elevators in only two places. The limestone overflows from the bin to the cement floor of the house.

The clay used is of light brown color and very fine, from the general appearance probably belonging to the Knoxville shales, which cover a large area north

as announced by the American S. & R. Co., amounts to but about 40 cents per 100 pounds, it means 8 cents per unit for lead in the crude ore, and this is a very substantial increase in ore value to those mines producing large amounts of lead, as in the Coeur d'Alenes, Idaho; at Leadville, Creede, Georgetown and the San Juan region of Colorado, and the lead producing sections of Utah and the Mississippi valley fields. While the increase in the value of the ore is only from \$1 to \$5 per ton, it is an all-important matter to many mines, and to some means the difference between profit and loss in operating. The press of the lead-mining regions universally express the satisfaction miners feel at the improved situation.

In Korean mines the pay of an ordinary Coolie laborer is 15 cents per day, neither food nor lodging being provided for him.

The Crown Mica Mine, Custer City, South Dakota.*

Written for the MINING AND SCIENTIFIC PRESS by
DENNIS HENAUZ.

This mine is situated about 3 miles in a northwesterly direction from Custer City, Custer county, S. D., and consists of two claims, each 300x1500 feet, lying side by side, and running north and south.

The mica occurs in large pipes in the vein. These pipes or shoots of mica have a dip to the south (in the veins) of about 30° from horizontal and are quite regular, both as to their direction and dimensions.

It is difficult to describe the occurrence of the mica in this mine without a diagram; but if you will imagine a lot of gun barrels driven into the ground at an angle of about 30°, one above the other, you may form a fair idea of the existing geological condition.

The occurrence of these shoots of mica in the Crown mine is different from that of any other mine I have examined or of which I have any knowledge. There are five veins in this property. The shoots all take the same dip to the south, but vary in width in the different veins, being from 4 to 10 feet. To make this still plainer, I will explain by saying it is a series of veins running north and south, dipping almost perpendicular, each carrying its own series of shoots of mica in the form of pipes, which dip south to unknown depth, each shoot coming to the surface and making an irregular cropping for about 100 feet in width and about 600 feet in length.

The walls in each case are of mica slate in the Archean formation, while the gangue matter, in which the mica is found, is simply a very coarsely crystallized granite of intrusive origin. It will be understood that normal granite is composed of potash feldspar, quartz and mica, but that in this case each of the constituents have crystallized separately in exceptionally coarse masses or crystals. Thus we have the feldspar by itself, quartz by itself and mica by itself, the latter in the form of books," which vary in size from 1 inch square to 12x20 inches across.

Mica consists of a silicate of alumina, with small proportions of silicates of potash, soda, lithia, oxide of iron and manganese. The mica in this mine is plentiful and of good quality; the "books" are found in rocks of medium hardness, lie in all directions and are very irregular in shapes and sizes.

To prepare this mica for market, the largest and best mica is split into sheets of suitable thickness and cut into sizes adapted for stoves, while the more irregular pieces are simply trimmed and sold for electrical purposes.

The small mica is split very thin and built into large plates by means of an adhesive substance and heavy pressure—a patented process. The waste mica is ground into powder and is used in the manufacture of paint, axle grease, safe filling, wall paper and in various other ways.

The development consists thus far of several open cuts, the largest of which is 400 feet in length and 35 feet in depth at the face. (See illustration, page 167) One shaft is 80 feet in depth, with cross drifts of 15 and 20 feet, respectively. The main shaft (two compartments) has been sunk to a depth of 100 feet, from which level a drift has been run along the vein for 200 feet.

From the 50-foot level in this shaft a cross drift has been run, disclosing four different mica-bearing veins with their shoots, as before described.

There is a good engine building, with steam hoist, boiler and dynamo, and the mine is equipped with a motor, electric drills and steam pump. There is also a complete blacksmith shop, change house, office, boarding house and stable.

The nearest point to railroad is Berne station, on the B. & M. R. R., 1 mile north of the mine. There is some timber on the claims and it is abundant in the adjacent country, with plenty of water near for all necessary purposes.

A brief history of the property may not be uninteresting. The mine was located in 1881 by George Clark and was transferred during that year to H. C. McMacken, Thomas Haight and J. V. Offenbacher and was known as the McMacken mica mine. These parties took out and shipped about 100,000 pounds of cut stove mica, from the cuts at the surface, which sold at an average of \$2 per pound.

In the early '80s the price of mica went down; so this mine was shut down and no mica was shipped for several years.

In 1890 the mine became the property of M. Daly, who in 1895 leased it to Mr. Major of St. Louis, Mo., who worked it during the summer, took out about a carload of mica and surrendered his lease.

It was next leased to S. A. Baxter of Lima, Ohio, who took out about 5000 pounds of stove mica and about five tons of mica for electrical purposes. Mr. Baxter surrendered his lease in 1897.

In 1900 the mine was sold to the Chicago Mica Co., with F. C. N. Graydon as superintendent.

This company took out about ten carloads of mica—partly from the old dumps and partly as it came

from the mine—during the year 1900. Mr. Graydon continued to work the property until April, 1902. Since then the property has been closed down.

Lately the Crown Mica Co. has been organized for the purpose of purchasing the Crown mica claims. They have completed arrangements whereby they have a market for all they can mine. They are preparing to equip the mine with new and improved appliances and to work it on a more extensive scale.

This company has a fine field for its energies, for, notwithstanding all the work that has been done, and all the mica which has been taken out, it may be fairly said that the mine has only been scratched. From unmistakable indications, there is a large amount of mica yet to be exploited in this ground, and this generation will not see it exhausted.

There are many other mica mines surrounding Custer. Most of them are found in the micaceous slate, while there are a few found in the granite formation of the Harney range. Important among these are the New York, Lost Bonanza, Climax, Monarch, Old Mike, Russell, White Spar, Sun Dog, Gaughenbaugh, Grand View, Chapman, B. & M., Pierce, Window Light, Noble, Occidental, Shoemaker and Mica King, besides which there are many prospects which may prove to be mines in the future.

In each and all of these mines the occurrence of mica differs, and they all differ in their characteristics from the Crown.

Custer, March 2.

Machine Drilling in Stopes.

For many years the economy and effectiveness of machine drills in driving drifts in mines and in tunneling generally has been recognized, but stoping operations with the machine drill dates back only a few years, and is even now not in general use. In some stopes it is inadvisable, owing to the loose character of the ground, but in many cases the machine drill in stoping is recommended. The following hints on drilling in stopes with machine drills are given in Engineering News:

It is a most common thing in reading a description of mining operations to run across some such statement as this: "We were compelled to give up the use of machine drills in stoping, as hand drilling was cheaper."

It is seldom that the writer explains why power drills proved a failure in such stopes, although they are decidedly economic in driving crosscuts, headings and the like.

In tunnel and shaft sinking work, drills of a large size mounted on a bar are used. It naturally follows that, already owning such drills, the mine superintendent tries to use them in overhead stopes, often with discouraging results. The trouble generally is that in drilling through the ore body seams are encountered which tend to deflect the drill, causing it to bind. Forthwith the miner picks up a sledge and strikes the drill viciously, often breaking some part of the machine in his effort to loosen the drill. If the seams are numerous the miner is thus engaged more than half his time in pounding the drill; and very often a hole is completely lost through inability to drive the drill deep enough on account of its binding. The most natural thing in the world, then, is to cast aside the power drill entirely, and in so doing an expensive mistake is often made.

If instead of mounting the drill on a bar it be mounted on a tripod, the trouble due to binding may often be done away with entirely, for the very simple reason that the moment binding begins the whole machine may then be moved slightly by raising or lowering one of the tripod legs. This slight change of drill alignment may be made by the chuckman, often without stopping the running of the drill at all.

A tripod in overhead stoping, however, cannot be quickly or readily set up and moved about because of the irregularity of the broken rock surface upon which it stands. This difficulty may be easily overcome by making a rough platform of lagging, which can thus be used over and over again.

We would suggest also that a wood triangle, shown in Fig. 1, would serve the same purpose as a plat-

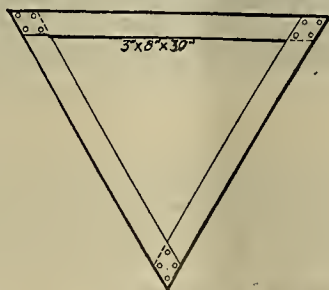


Fig. 1. Wood Triangle for Drill Tripods.

form, even better. Such a triangle has been used to excellent advantage in open-cut rock work. Our next suggestion for facilitating drilling in seamy ground is to make the short bits, which are used

first, larger in diameter than the longer ones. Any one familiar with drill running knows that the deeper the hole gets the more frequent and troublesome becomes the binding of the drill in seamy rock, or rock of unequal hardness.

Another expedient is to use drills of special form, having shoulders or wings extending up the drill shank for 6 or 8 inches from the cutting edge, and of diameter only a trifle less than the bit, so as to fit the hole quite snugly for these 6 or 8 inches. These wings check the tendency of the cutting edge to follow the slant of any seam encountered, as will be seen in Fig. 2.

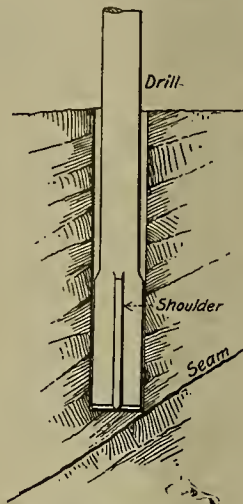


Fig. 2. Special Drill for Seamy Rock.

In the copper mines of Lake Superior the native copper causes a great deal of binding, which grows worse with increased depth of hole. The drill runner knows that the first foot or so in seamy rock may be easy running, but after a certain depth is reached the trouble begins. Then the only thing to do is either not to drill deep holes (say only 3 to 4 feet deep), or to struggle ahead in spite of the numerous delays. A shallow hole is inefficient, a deep one is costly; the miner must set the one against the other and split the difference.

If a small drill is started in a larger hole there is still some danger of binding due to the failure of the small drill to follow the center of the large hole. The small drill crowds off to one side. Even so it does not stick so frequently and persistently as in holes of uniform diameter. A collar might be provided for the smaller drill, to center it in the hole at the start, although there are some practical objections to the use of such a collar. Finally, we come to the weight of the power drill used. In narrow stopes the large size ordinarily used is entirely "out of the running," because it cannot be set up and handled at all in a very confined space. Then one of the small "Baby" drills, weighing 175 pounds, tripod and all, may be used to advantage. It will take some little time and judgment for a miner accustomed to the large drill on a bar to learn how best to handle the "Baby" drill on a tripod. Such a drill when properly handled, however, will readily drill 40 feet in seven hours in quartz full of slips; and two men using hand drills in the same kind of rock have been known to stop just half as much ore per shift as they did afterward using the "Baby" drill on a tripod.

Many mine managers are too ready to accept the verdict of old miners relative to the value of power drilling in stopes. The miner, as a rule, is not a very patient man, and becomes easily disgusted with a machine if it fails to work satisfactorily right away. For this reason the boss or manager can spend time to no better advantage than in standing right by a new machine, or an old one, in new ground. He will then frequently discover a cause of trouble that a less intelligent or less interested man would never see.

Tailings at Ely, Nevada.

TO THE EDITOR:—I wish to call attention to a letter published in the MINING AND SCIENTIFIC PRESS of Feb. 28, from W. H. Wickham, headed "Cyaniding at Ely, Nev." Mr. Wickham presents, as an illustration of Chainman ores, the results of eight tanks. The average heads of the first five is \$3.07; tails, 83 cents. The other three average: Heads, \$3.51; tails, \$2.11. Now, since Mr. Wickham left the employ of the Chainman Co. there has been at least a dozen assays made from the tailings dump. Of the first five the lowest was \$1.80, the highest \$4.80. Another hatch of assays averaged \$3.80, and still another assay, taken from ten different places, assayed \$6.24.

A tank of ore that Mr. Wickham leached, that is now in the tanks at the Chainman mill, was sampled by Mr. Corning, of Olcott, Corning & Peale of New York, and found to contain a valuation of \$6 a ton.

L. F. SHEPHERD.

Ely, Nev., March 13.

*See illustration on front page.

High Benches of the Nome Gold Fields.

Written for the MINING AND SCIENTIFIC PRESS by
OTTO HALLA.

On the divide of Anvil and Dexter creeks in the Nome region, at an elevation of about 500 feet from the level of the sea, in 1900 a discovery was made of auriferous gravels at a depth of 40 feet. This discovery was followed by many more so that towards the end of the season of 1900 a string of valuable claims have been found on the benches off Dexter creek and crossing the divide to Anvil creek. All of them have proven to be rich. The Mattie F., the first claim discovered, has produced in the neighborhood of \$250,000 up to date; the Madeleine, the Daisy, the Snowflake, Sugar, Honey, Molasses and Bowery all are properties which will in time add materially to the output of gold of Nome. The discovery of the rich bench ground has stimulated the prospecting of the hillsides and benches of other creeks, and invariably the result has been satisfactory. It has proven in many instances that benches of low-paying creeks are better than the creek claims, as is the case on Dry creek where a little pay has been found, but nothing in comparison to the valuable bench ground of that creek.

Now the question may be asked, what caused the change in the channels of the creeks and why are the present creek beds spotted, one claim rich in auriferous gravels and the other adjoining it not containing anything? There is no doubt that the creeks at the time of the first gold run had an entire different watershed, in fact it seems that the present watershed is almost diagonal to the original run of the creeks. This may be due to different causes, the most plausible of which is, the uplift of a whole section of the peninsula, causing the creeks and river to seek other outlets, and in their course forming new ravines, creeks and rivers. The auriferous gravels lifted up, formed the benches in many instances which were covered by mountain slides and also finally by glaciers. The new rivers and creeks were fed by tributaries deriving their source in those same old channels, and naturally they in turn would have gold washed into their beds, depending in many instances on the richness of the old river channels for their values. Where a large creek crossed the old channel, there would be a larger deposit of gold, the amount of water causing the more wash down the mountain.

This is what happened in the Nome region at any rate. Looking from the diggings of the Sugar claim in a westerly direction one may observe the continued string of paying claims to Nekkla gulch, then to Anvil creek, across the other divide to Snow gulch, then Glacier creek, and then to the Hot Air bench. The streak has not been traced farther. The Snake river intervenes at that point, and it may have turned northward, as a paystreak again is found on Oregon creek benches, which compares very favorably with any ground in the neighborhood of Nome. Beyond, again a gap of unprospected ground, and finally the paystreak makes its appearance in the benches of Gold Run. On the other hand, it travels southeasterly to Buster creek across Osborn, where it is completely lost. This, however, is not the only streak of paying gravels. The headwaters of Nome river have a distinct paystreak of their own, by which its benches are fed, as large deposits of gold-bearing gravels have been found over 1 mile off the present channel of the river. So has Solomon river its own feeder, commencing at Topkok, crossing to Big Hurrah, Solomon and Kasson creek, where the trace is lost. And so throughout the whole section. It depends upon the lay of the creek, the direction in which it runs and the supply it has to draw from whether it is a paying creek or not. It depends where the old channel crosses it whether the claim is a blank or not. Cases of this kind are demonstrated on Glacier creek. Not one claim above Snow gulch has paid, for the reason that its headwaters do not have their source in any of the old channels of the gold-bearing gravel.

Bench prospecting has received during the last year a great impetus, on account of the discoveries of the Anvil and Dexter benches. It is, however, more expensive than ordinary creek prospecting, but its importance is daily being more demonstrated, and the possibilities of gold output as the result of the discoveries already made are such that they will make bench prospecting even more lucrative than developments on creeks.

There is a vast area of bench land on the Seward peninsula which will sooner or later be productive; there has to be, however, capital invested in prospecting the ground. Up to now very few individuals or mining companies have paid out a large amount of money for legitimate prospecting but what they have been more than a hundredfold repaid; the cases of C. D. Lane, the Wild Goose M. Co., the Pioneer M. Co., the Alaska G. M. Co., Mathews & Co., and Kelly & Co. may be cited as instances. Of course, where mining companies are organized for the sole benefit of the promoters, and do nothing whatever in

developing the ground, these cannot expect even to be considered as operators in the gold fields.

The discovery of the Nome gold fields is the repetition of the California discovery of gold as far as the amount of gold produced will be concerned; the short season of hydraulic mining (four months) may have the tendency to prolong the period of extraction for many more years, but on the other hand there are no agricultural interests to be taken into consideration, and a legitimate investment of capital in the

N. A. Copper Mining Co.'s Aerial Tramway, Grand Encampment, Wyoming.

Written for the MINING AND SCIENTIFIC PRESS.

The difficult question of transporting the ore from the Ferris-Haggerty mine, Rudefeba, Carbon county, Wyoming, to the smelter at Grand Encampment, re-



Tramway Terminal at Smelter, Encampment, Wyo.



Shaft House, Haggerty Mine, Encampment, Wyo.

shape of hydraulic pipe systems, pumping plants and of permanent improvements will bring its returns, more than any other business investment, for many years to come. The creeks will be washed out in a few years, but the future of this section lies in the immense deposits of auriferous gravel of the high benches.

Nome, Alaska, December 1, 1902.

COLOMBIA leads the South American countries in the output of gold for 1902 with \$2,775,400. Brazil produced \$2,801,000 gold and \$1,129,000 silver, Chile \$1,067,000 gold and \$5,553,000 silver, Peru \$1,329,000 gold and \$3,360,000 silver, Bolivia \$6,157,600 silver.

sulted in the building of an aerial tramway, a distance of 16.1 miles. The idea of thus handling the Ferris-Haggerty ore was originated by W. G. Emerson and B. McCaffery of Denver, Colorado. The contract for the erection of the tramway was given to the Mine & Smelter Supply Co. of Denver, who engaged B. C. Riblet of Spokane as consulting engineer. The material was furnished by A. Leschen & Sons Rope Co. of St. Louis, Mo. The material was hauled to Grand Encampment, 45 miles from the railroad, and from there distributed along the line of tramway.

To facilitate the construction it was necessary to build 24 miles of wagon road. Cables weighing 17,-

000 pounds, and requiring twenty horses to haul same, were taken over this road.

On February 24th, 1902, the surveying corps commenced locating the line and taking elevations. The altitude of the loading station at the mine is 9500 feet. The discharging terminal at the smelter is 7200 feet above the sea. The line at an elevation of 10,860 feet crosses the Continental divide just south of Bridge's Peak. Profiles were then made and the derricks located. A strip of ground 100 feet wide

way was in operation on September 26, 1902.

The tramway is constructed in four sections, each section having a fall of from 500 to 700 feet. There are two slight angles in the alignment to avoid the impassable country and also to divide the fall as near uniform as possible in the various sections.

There are 289 derricks on the line. The spans vary from 250 to 2100 feet, two of them being 1950 and one 2100 feet. The derricks are of the four-post type and are made of sawed timber. The average

The traction rope has a speed of 250 feet per minute. The track cables for conveying the loaded buckets are 1½-inch in diameter, made of crucible cast steel, seven wires, six strands lang-lay. The traction ropes on the lower sections are ¾ inch in diameter, made of crucible cast steel lang-lay, nineteen wires. The track rope is made up in 1-mile sections, the tension being maintained by tension stations. The traction rope is made in 2-mile sections.

Near the middle of the line the ore is dumped from the buckets into a bin and from there drawn off into the buckets on the next section below. At the other sections the buckets, after being automatically detached, are transferred from one section to the other and automatically attached to the next section. At the lower terminal the ore is automatically distributed into a series of bins by means of a device designed by B. C. Riblet.

A telephone system was constructed as fast as the derricks were erected, a line being kept up every day with the erection. Portable phones were provided along the line and the construction work was always in direct communication with the engineer's office, material yards, warehouses, etc. From 50 to 260 men were employed on the work.

The power for operating the tramway is furnished by four side-crank engines. The engines on the two lower sections, where the fall is greatest, are 40 H. P. each, and on the two upper sections 60 and 90 H. P. The engines are provided with link motions. It is the intention of the company to drive the tramway by electric motors as soon as their new power plant is completed.

Before the completion of the tramway it was sold to the North American Copper M. Co., who are doing considerable work in and around Grand Encampment.

Pyritic Smelting.*

NUMBER II.—CONCLUDED.

By FRANKLIN R. CARPENTER, Ph. D.

A typical example of the second class, where the ore is 50% silica and alumina, and the remaining 50% mixed sulphides, but mainly iron pyrite, calls for the following charge with cold blast: 1000 parts ore, 800 parts limestone, 300 parts coke.

The concentration will be about 15 tons of ore into 1 ton of matte, with a 40% to 46% silica slag, and a cost of \$4.50 per ton. This ore carries sufficient pyrite and copper to form a matte so that all the ore treated bears a smelting charge. This case will approximate to one of the third class in the proportion in which we can replace the limestone and coke with iron pyrite. The fuel value of the pyrite may be taken at 0.4 that of coke, and its fluxing value approximately as the given weight of metallic iron, replacing the equivalent weight of CaO. It will be necessary to heat the blast. A short calculation will show that to replace all of the coke it will require $300 \div 0.4 = 750$ pounds of pyrite. Roughly, also, we may consider the pyrite as carrying an excess of 40% Fe, and the limestone 50% CaO, so that this percentage of pyrite will replace 600 pounds of limestone, and the charge becomes 1000 pounds of ore, 200 pounds of limestone, 750 pounds of pyrite—1950 pounds.

The charge will require 5% coke and 10 tons of coal per day for the hot air stove. If the pyrite is also an ore that will stand a smelting charge, the cost will be lowered to \$1.40 per ton of pay ore. It may be that a smelting charge cannot be had upon the pyrite, but, as at Buena Vista, Colo., it costs the works, delivered f. o. b., its whole gold and silver value. But as it is still both flux and fuel for the siliceous ore, it may be advisable to use it. In this case the cost per ton on the above charge would still be reduced, but only to \$2.42. It will be observed that as we have extra heat from the stove it would seem that no coke would be needed, but this blissful state of affairs, while theoretically possible, is never reached in practice. Either from the impossibility of securing the theoretical full value of the pyrite, owing to irregularities in the ore, or in the working of the furnace, or because of mechanical conditions of the ores, some coke is always required.

The third, or last, example of pyritic smelting in all its completeness occurs when heavy pyrite ores are to be smelted, and reference may be had to Keswick, Cal., for example.

Anyone can employ pyritic smelting as I have here sketched it. It is not a patented process, either with cold blast or with hot blast.

There are, indeed, many patented devices, such as special styles of furnaces, or special methods of heating the blast. One inventor utilizes the waste heat of the slag—most promisingly, it is said—Mr. Lang's method. Another claims that he employs his forehearth effectually for the purpose, while others utilize the waste heat from the top of the furnace. Devices for this last scheme are as old as the hot blast itself, and it is doubtful if modern ideas are more effectual than the ancient unpatented devices, drawings of which may be seen in "Overman's Metallurgy," published in 1852, and others more ancient,

* From Bulletin Colorado School of Mines, condensed.



Dam in Course of Construction, Encampment River, Wyo.



Double Tension on Tramway, Encampment, Wyo.

was cleared of brush and trees. Foundations for the derricks were staked out and the excavating begun. The timber was hauled from the mills to the framing yards located at intervals along the line. The derricks were all framed and marked by letters and numbers showing the position of each stick. They were then distributed along the line and the erecting crew raised the derricks and bolted them together. The saddles and sheaves were then put on, and finally the cables were strung. The progress of the work was limited entirely by the delivery of the material. The snow did not leave the upper section sufficiently to permit of the surveying being completed until the latter part of July. In one day as many as eleven derricks were erected, and frequently in the same length of time a mile of cable was placed in position. The work was carried on from camps, which were located along the line every 4 or 5 miles. The tram-

height is about 30 feet, but several reach the height of 70 feet. The derricks are constructed unusually high on account of the excessive snowfall, which in some places along the line reaches 30 to 35 feet in depth.

There is no angle in the track rope of more than 3° over any derrick. The derricks are arranged to conform to the unloaded cables, so there is no danger of the cables lifting out of the saddles when the line is stripped of its buckets, nor of the traction rope, even under its maximum strain, being lifted off its sheaves. An adjustment is provided whereby the sheaves supporting the traction rope can always be adjusted to the right height without stopping the tramway, an arrangement which will be appreciated by the party operating the tramway.

The tramway has a capacity of 500 tons per day. The buckets have a capacity of 650 pounds each.

of stoves placed at the top of the furnace—in chambers leading from the top—stoves heated partly by waste heat and partly by extra fuel, all of which may be employed by anyone. Without intending to say anything for or against any of these patented devices, my own impression is that one cannot forever get something for nothing, and that the proper method is to erect a stove upon established and tried methods, to heat it with extra fuel, and to figure the cost. Any stove for this purpose—unlike those for iron smelting, where there are waste gases to be utilized—must be heated by extraneous fuel. I employ an ordinary "U" pipe stove. It consists of sixty "U" pipes, 8 inches in internal diameter and 12½ feet long, or, if counting the curve in the "U," each pipe is 25 feet in length. This is intended for one furnace 3 feet by 16 feet at the tuyeres, which now with cold blast smelts from 300 to 400 tons charge daily. This form of the "U" pipe is not insisted upon. Any other form will doubtless do as well, and their forms are multitudinous, for, as Percy remarks, since the hot air stove was invented by Nielson in 1828 probably no metallurgical device has so exercised the ingenuity of inventors.

A brick stove could doubtless be used, employing oil or gaseous fuel. I am not aware that it has yet been used in pyritic smelting, but if possible I shall soon give it a trial. A "U" pipe stove such as I use will cost, complete, \$10,000, while duplicate brick stoves with gas producers, etc., will cost \$35,000.

COST OF A PLANT.—The medium-sized plant at Golden is as good an arrangement as I have been able to devise. It is a compromise between a terrace plant and one upon a plane.

The same before the stove was added consisted of one very large blast furnace, sampling works, ore bins, power plant, offices, etc., and cost, complete and ready to run, with cold blast, \$90,000, or with hot blast \$100,000.

A large plant, like that at Florence or Deadwood, costs about \$200,000, while if a complete refinery, consisting of a lead furnace, softening furnace, Parkes process, etc., is added, \$50,000 more at least must be included.

Upon the other hand, less effective plants can be erected. A plant for the ores of a single mine—or not requiring sampling works—capable of smelting from 50 to 75 tons of ore daily may be erected for \$10,000, if in an accessible section. This I consider the minimum cost of an effective plant. It will consist of engine, boiler, blower and stack, but no sampling works, little or no dust chamber, and no offices. This was the cost of the first experimental Deadwood & Delaware Smelting Co. plant, which did good work.

SCOPE OF THE PROCESS.—I do not think that pyritic smelting can ever replace the lead process for custom plants like those of Colorado. It is also unsuited for very rich ores, which would best be sold to the large smelting works, but, for out-of-the-way places, or for rendering valuable those ores that do not lend themselves readily to water concentration, it has a field. It is also suitable for ores from a particular mine or section, where both mine and smelter are under one management; for ores can be treated at the mine or in the vicinity which could not be transported to a distance and sold to advantage. The attempts at pyritic smelting are many, the successes few and far between. The old works mentioned in the metallurgies—the one at Toston, at Boulder, Mont., at Mineral, Idaho, at Leadville and at Kokomo, Colo.—have all ceased to run, and most of them years ago. It is doubtful if any of them will ever run. Upon the other hand, the principles so laboriously worked out by these pioneers have been utilized at other places, and by other men, and bid fair to profoundly affect the metallurgical profession.

THE REFINING AND DISPOSITION OF THE MATTE.—In the revival of this ancient process of pyritic smelting no one until recently sought to revive their methods of refining the matte. This matte, when low in copper and high in iron, was a desirable product for the lead smelters, who bought it, paying therefor barely its full gold, silver and copper values, that they might obtain the iron free for flux. This left the refining charges practically nothing beyond freight and a nominal charge—in some instances nothing—for the mechanical handling of the product. It is none the less desirable now, but since the various lead smelters have been united under one management there is no longer any competition for it, and they have made a higher refining charge. Even now, however, they are not extravagant, although every pyritic smelter is in a small way a rival to the great company. Ordinarily, therefore, it is still more profitable to sell to the trust than to attempt refining. But plants remote from railroads, or, for other causes, finding it inexpedient to sell to the American Smelting & Refining Co., have the question to meet.

In the old days matte made by the raw or pyritic process was almost invariably treated by a process called in Germany "eintrankheit," which is usually rendered into English by the expression "lead soaking." If the matte contained little or no copper it was simple enough. The hot matte was tapped into pits, or forehearth, containing lead, or to which lead was added. When the lead was sufficiently enriched it was cupelled, for this was before

the days of Pattisonizing or of the Parkes process. Not a very high percentage was extracted in this way, but that remaining in the matte was not lost, as the partially desilverized matte was returned to the ore smelting, just as any other pyritic material. A certain percentage was thus tied up, but in the end was recovered. Had this matte been smelted directly with the metallic lead, a far larger percentage of the values would have been had at once, but the loss of lead would have been infinitely greater. If the matte contained copper, as was usually the case, the process was more complicated, as metallic copper must in the end be produced, and this would carry values that could only be recovered by the truly ancient means of liquation. Probably the highest development of the lead soaking process was to be seen at Kongsberg, Norway. The ores carried no lead at all, and the whole of it, in the form of pig lead, was imported direct from England. The pyrite used, however, carried copper, which much complicated the process. Yet such a degree of skill was developed that ores carrying less than \$4 per ton of 2000 pounds, if delivered at the works free from other charges, could be smelted and refined without loss. The whole cost, therefore, including smelting, refining, loss of lead—when it was much higher in value than now—was less than \$4 per American ton, and the amount recovered was slightly in excess of the assay value of the ore. A full description can be seen in "Percy's Metallurgy of Silver and Gold," page 504, et seq. This process was maintained there for nearly three hundred years, but recently has given way to the electrolytic process. At Mansfeld, Germany, silver-copper mines were opened seven hundred years ago. The product obtained has always been a silver-bearing matte. From these mines were obtained very largely the gold and silver which developed modern European civilization. Here originated liquation, amalgamation, the processes of Augustin and Ziervogel. All had their day, and in the order named. But here, too, electrolysis is displacing all other methods. The Ziervogel, the last named and most beautiful of the old processes, was introduced into America by Richard Pearce at his works at Black Hawk, Colo., and later at Argo, near Denver, Colo., where it is still employed. His full description of it, published in the Transactions of the American Institute of Mining Engineers, has become classic—at least as much so as anything metallurgical can become in America. Mr. Pearce also, for a while, employed the Augustin process, but neither of these processes provided for the extraction of the gold—which is at Argo obtained by other means, of which we know nothing, save our conjectures. After the silver is recovered by the Ziervogel process the gold is easily concentrated into copper bottoms, which gives a gold-copper alloy that may be treated by one of the many processes. In the end this field will be occupied, I believe, by the electrolytic method, to the exclusion of all others. The matte made at our plant at Deadwood, except that it was made by blast furnaces, resembled that at Argo, save that it was far richer in gold. It has always been treated by lead, notwithstanding its high copper tenor. It is crushed, sampled, and sold as an ore. It was then added direct to the lead furnaces employed at Omaha in gold and silver ore smelting. The very high grade copper matte thus treated came out of the furnace much lower in copper than it went in, as it was adulterated by the other matte formed in the ore smelting. It was, apparently, a step backward, but in reality it was not so, for it had given up to the base bullion nearly the whole of its gold, and in the subsequent matte refining it mattered little whether the matte was 10% or 20% copper—the result was the same. After this point it was no longer my process, and, while perfectly familiar with it, I do not feel at liberty to describe it. The matte treatment, however, can be continued as lead smelters usually perform it—for which reference can be had to Hofman, or Schnabel, or Collins.

In any of the lead soaking or lead smelting processes the base bullion, or the work blei, as the Germans call it, may be refined by the ordinary Parkes process. A complete plant of this kind is simple, consisting of a softening furnace, desilverizing kettles, refining furnace, zinc retorts, and cupelling furnace, and if the production of market lead is not the object, but only the freeing of matte from its value, \$20,000 will be ample for its erection, while \$50,000 will give a very complete plant, capable of producing market lead and blister copper.

Such a plant, avowedly experimental, was designed by me. A small round furnace was for the resmelting of the matte, either with lead or lead compounds—or for the simple melting down of the matte—which was then allowed to run into either one of the two "leading" furnaces. They were arranged to be used alternately. In either of the two furnaces two or more soakings could be had (in Russia four were formerly employed), the lead from the first going direct to the cupel, while that from the second, third or fourth soaking or washing was used over. From the leading furnace the enriched matte was to be drawn into the softening furnace, and thence to the desilverizing kettles for the Parkes process, differing in no way from ordinary refineries. The discharged matte went to the test furnaces, where the lead in the form of slag was recovered, and the matte was raised in copper contents until rich enough to ship, or even

until black copper was formed. The first part of the process was borrowed directly from the old European practice, and the second was simply an addition of modern methods of refining the lead. Had it been desirable to have employed a lead furnace the lead soaking would have been avoided, and simply softening furnaces used, which was the modification finally made by my successor.

An attempt was made to do "lead washing" at Pueblo, Colo., some years since by Crookes. The desilverizing part is said to have been most perfect, but the process failed on account of the cost. But whether it was the first part, viz., the "lead washing," or in the latter part, where refined copper was made, I am not informed, but I believe that it was the copper end that failed.

OTHER PROCESSES.—The copper-bearing matte may be roasted and smelted with siliceous ore directly for black copper, which will carry most of the gold-silver values, while the rich slags produced by this step may be returned to the ore furnace.

Having obtained black copper, there is now no difficulty in disposing of it. Owing to its compact form, it can be shipped to seaboard refineries, or even to Europe, and good prices received for it, but it is difficult to sample it properly. If we do not wish to take the risk we may at once treat it by any of the following processes:

1. It may be refined electrolytically. The products are refined copper, which is cast into ingots and sold as such. The slimes are smelted and cast into dore bars. Doubtless this is the best of the many processes, and while it requires a moderately costly plant the real objection is that it ties up much value for long periods, and refined copper is not usually the main object in pyritic smelting.

2. Sulphuric acid. It may be dissolved in sulphuric acid, giving rise to:

- a. Slimes, carrying gold and silver, which are refined and cast into dore bars as before, and

- b. Copper sulphate, which is purified and sold as such. This process is very cheap, if one can sell the sulphate so produced, as more than the value of the acid and copper may be had for it, but owing to the control of the market by large companies it is difficult to sell at good prices. As it is a by-product, however, the main object having been the recovery of gold and silver, one is not obliged to get the highest price for it in order to justify the process.

3. The Jars process for gold. As this may be a new process to many, I will state why I have suggested this name. Jars, in 1780, in his "Voyages Metallurgiques," proposed this method to separate gold from metallic copper. It is probable that Jars had in mind only the "plate bottoms" obtained by the Welsb process of making "best selected copper," where the gold, along with many other impurities, is concentrated into impure copper. Having obtained these bottoms from matte, Jars proposed to cast them back into matte by granulating, roasting and fusing with sulphide material, and to repeat upon the matte so formed the copper bottom process, where a new bottom still carrying the gold would be obtained, but only a tenth of the size of the first. Of course, it is not necessary to actually repeat all the details of making bottoms, as a simple scorification with sulphide material would answer.

When applied to pyritic smelting all these processes have their peculiar disadvantages. Pyritic plants are usually built in out-of-the-way places, or in connection with particular mines. The object is the securing of gold and silver by the most direct methods. If the matte is resmelted with lead, the subsequent desilverizing by Parkes' process and refining the lead for market is somewhat complicated. The Ziervogel process, besides not recovering the gold, is a most delicate operation, requiring much skill, and while it may be supplemented by sulphuric acid, or by the process of Jars, I have sought some more direct process, and have devised the following: I propose to obtain in the ore smelting a very low grade copper matte, carrying say 5% copper. This will represent an average concentration of 12 tons of ore into 1 ton of matte. This I roast and smelt direct for black copper, obtaining, besides black copper, rich slags, which I return to the ore smelting furnace. The copper now represents a concentration of 200 to 240 tons of ore into 1. This I cupel directly with metallic lead, about six parts usually carrying off one of copper, obtaining at one operation

- a. Coppery litharge.

- b. Dore bars.

The coppery litharge is resmelted probably in a small blast furnace so as to obtain therefrom

- a. Metallic lead.

- b. Lead matte.

This lead, after softening, if need be, is used over with fresh copper, and the lead matte goes to a test furnace, which furnace was originally designed for my use in a slightly different process. The products are

- a. Metallic copper.

- b. Lead copper slag.

The latter is smelted in the small blast furnace along with the coppery litharge from the cupelling furnace, where both lead and copper are recovered.

I have also succeeded in scorifying the metallic copper with silica, and separating the gold and silver, which process has been the subject of a United States patent.

Copper Mining in Upper Michigan.*

Written by J. F. JACKSON.

Bordering the greatest fresh water lake in the world are iron mines of such vast extent and producing such immense quantities of ore as to almost stagger belief. The engineering features developed

metallic copper and other substances which have been deposited in them hypercolating ground waters. The ground waters are supposed to have gathered the molecules of copper from the adjacent trap rock. There are dozens of these amygdaloid lodes within the 3 miles of the mineral belt, many of which contain more or less copper in some portion of their length, but only a few have, after development, proved to

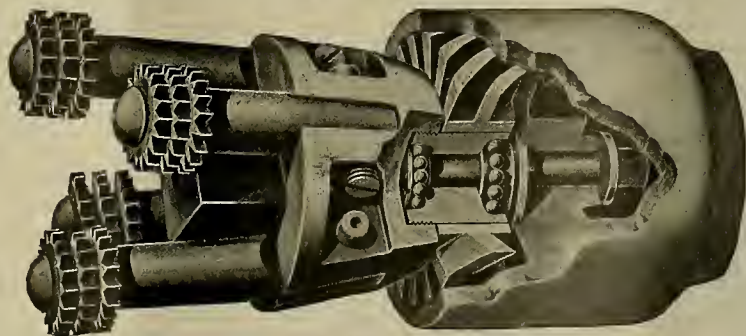
ancient mines were undoubtedly the source of copper knives, fishhooks and other implements so much prized by the archaeologists. The government land surveys of this district were made in 1844, and active mining for copper was begun at about the same time, and has continued ever since. Many of the early miners came from the old tin and copper mines of Cornwall, England, and Cornishmen and their descendants are to-day the leading mining men of the district. In early days the country was reached by steam and sailing boats via the Great Lakes. All copper was shipped out and supplies brought in by boat. Direct connection by rail was not obtained until 1886, twenty years after the great Calumet & Hecla was opened. The price of copper has varied from 60 cents to 10 cents per pound, so that the country has had a succession of booms and times of depression. The great development of electrical machinery within the last ten years has, of course, greatly stimulated production, and many new mines have been opened. At present the great producers are the Calumet & Hecla, Tamarack, Osceola, Quincy, Champion, Trimountain and Wolverine, besides several small ones. Owing to the fact that United States surveys were made in 1844, ownership and description of mineral lands are by sections, quarter sections, etc., instead of by mining claims located at apex of lodes as in Western States. This fact has probably saved a great amount of litigation.

In attempting to describe the process of getting out copper in this district, I shall, for the sake of clearness, make statements which are true in general without noting every little exception, and I fear, also, without being able to arrange my facts in logical order. In general, copper in Montana and Arizona is found in the shape of an ore, such as a carbonate or sulphide of the metal, whereas the copper of Lake Superior is found in the pure metallic state incorporated in amygdaloids, or conglomerates, of which it forms $\frac{1}{2}$ to $\frac{4}{100}$. A copper lode is usually from 12 to 20 feet in thickness and extends from at or near the surface in a broad flat layer of indefinite extent into the earth at an angle or dip from the horizontal of from 25° to 70° . The Calumet & Hecla has a dip of 38° and the Quincy 50° . In opening a lode shafts are sunk at intervals of 1000 feet or more apart and follow down the inclination of the lode. Shafts are generally divided into three compartments and measure about 6 feet by 18 inches inside of timbers, giving two compartments for skip tracks of standard gauge and a third compartment for ladders and pipes. Fig. 2 shows the underground workings of the Wolverine mine.

(TO BE CONTINUED.)

Boiler-Tube Cleaner.

The accompanying illustration shows the latest form of the turbine boiler-tube cleaner made by the Lagonda Manufacturing Co. of Springfield, Ohio, from the designs of Mr. Weinland, who, it is claimed, was the first man to put a turbine cleaner to practical use cleaning boiler tubes, the present machine being the natural outgrowth from the original during the 20 years' experience in making and using such machines. The motive power for driving the star-shaped cutters is the stream of water which flows through the turbine buckets shown, the rotary motion of which is transferred to a spider carrying the cutter arms. The water is brought to the cleaner under pressure through a hose attached to the back end by a patent coupling, which makes a perfectly smooth connection without any obstruction to the movement of the machine through the tubes or the water through the hose. The arms carrying the cutters are pivoted in the spider so as to move freely, the centrifugal force, when the cleaner is at work, forcing them against the tube. This spider is screwed fast to the turbine hocket wheel, which revolves on two sets of ball bearings. The head of the bolt holding the turbine in the shell and a steel cone set into the shell form the cones of the ball bearings, the cups being on either end of the turbine wheel. The guides for leading the water to the hockets are cut through the inner partition of the shell, as shown, and the water after leaving the cleaner serves to wash the refuse out of the tube and away from the



Weinland Boiler-Tube Cleaner.

met & Hecla and the Franklin Jr. mines are developed on conglomerate lodes. The copper in this case is found in the interstices between the pebbles. Those interested in the geology of the country will find the subject ably treated in Foster & Whitney's government report.

A word as to the history of the country may not

The copper range, or mineral-bearing formation, which is about 3 miles in width, extends from Keweenaw Point in a southwesterly direction about 60 miles to Ontonagon. Its course is generally parallel to the shore of Lake Superior. (See Fig. 1). Copper is also found at various places as far west as a point on the St. Croix river, south of Duluth. It is not a particularly rough or rocky country. There are outcrops of rocks, but most of the country is covered with from 10 to 200 feet of glacial drift supporting a heavy hardwood forest. This band of mineral bearing formation is composed of hundreds of more or less parallel beds or strata of alternating traps, amygdaloids and conglomerates. The strata, where edges show at the surface, dip to the north under Lake Superior, at angles varying from 25° to 70° from the horizontal. Passing under the lake some of them outcrop again on the other side at Isle Royale, where the dip is to the south, or just the opposite. Geologists will tell you that this mineral belt is bounded on north and south or on top and bottom by sandstones, and that amygdaloids and traps are merely the tops and bottoms of great flows of lava, the tops of the flows being something like slag, quite soft and full of vesicular cavities formed by expanding gas or steam when the material was deposited, and in a plastic condition. These amygdaloids or almond-shaped cavities, varying in size from huckshot down, are filled more or less with

*Trans. Jour. West. Soc. Engrs., condensed.



FIG. 1.

Map of Keweenaw Point, Mich.

in this region have been waiting for some years for adequate description from an engineering point of view. Many of us have only a vague memory that our school geographies showed—a small peninsula extending into Lake Superior, upon which the word copper was marked. Copper has been mined in upper Michigan since 1844, when Chicago and Milwaukee were hardly more than small villages.

have sufficient mineral to make a paying mine. Amygdaloid lodes which are developed vary in thickness from 10 to 40 feet or more, and are often opened underground for a mile or more in depth and from one to three miles in length.

Besides the amygdaloid copper-bearing lodes there are many beds of conglomerates, which are simply beds of each gravel cemented together. The Calu-

WOLVERINE MINE



FIG. 2.

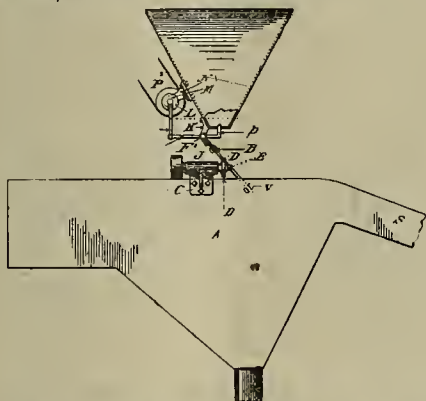
Longitudinal Vertical Section Wolverine Mine.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 10, 1903.

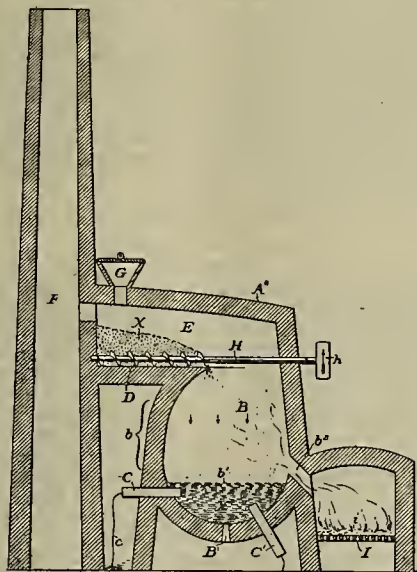
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

GRAPHITE SEPARATOR.—No. 722,211; J. H. Davis, Glen Falls, N. Y.



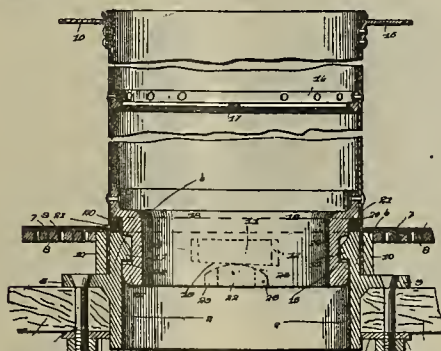
Means for feeding powdered graphite to a separator, including hopper, provided with a series of holes or openings in its bottom, series pointed pins adapted to enter holes, means for reciprocating pins into and out of holes, whereby holes are left completely open at times and completely closed at other times, distributing board, and means for moving board back and forth.

PROCESS OF REDUCING IRON FROM ITS ORE.—No. 722,253; M. Ruthenberg, Philadelphia, Pa.



Process of reducing iron ores to metallic state, continuous; consists in detaining each particle of mass of comminuted ore for definite time in region heated to determined degree less than reducing temperature, but temperature at which it is capable of being immediately deoxidized; then progressing particles of ore in granular form, and at determined rate through atmosphere of deoxidizing gas heated to such a degree as to effect reduction of particles during movement therethrough, without fusing particles; progressing reduced metal in granular form, at reducing temperature, into region of fusing temperature; and fusing reduced metal.

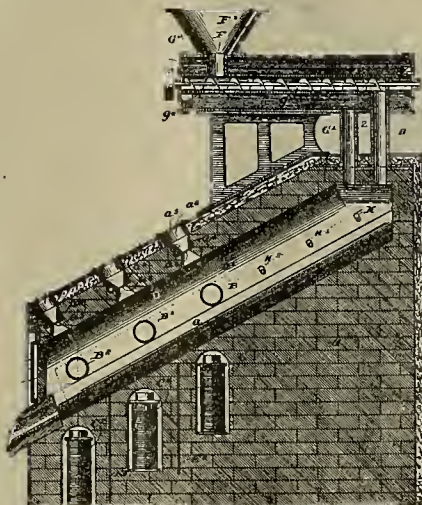
DISCHARGE MEANS FOR TANKS.—No. 722,314; H. Mitchell, Salt Lake City, Utah.



Discharge apparatus for tanks provided with casting having upwardly projecting rim provided with

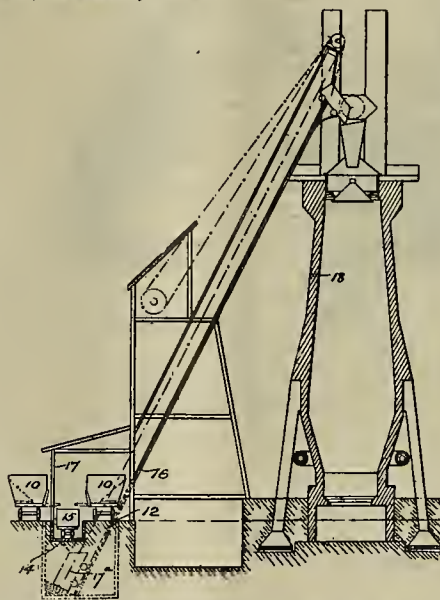
shoulders having longitudinally inclined under faces, funnel having base provided with depending offset portion, a gasket mounted in recess formed by offset portion and adapted to seat upon top of rim, lugs formed on depending portion and provided with longitudinally curved upper faces to engage inclined faces of shoulders, and operating handles at top of funnel.

ELECTRIC FURNACE.—No. 722,411; A. Shade, Chicago, Ill.



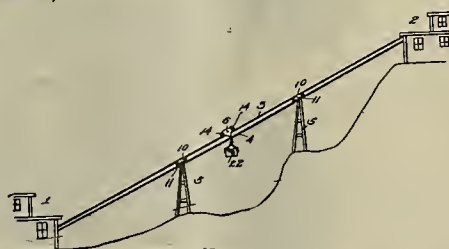
Electric furnace provided with passage inclined from upper to lower end provided in bottom with trough-like depression through which material to be acted upon passes by gravity, electrodes extending into passage with inner ends located above bottom of trough-like depression in manner to form plurality of arcs in passage, and separate means associated with each pair of electrodes for deflecting or elongating arcs into depression toward material as it passes successively beneath pairs of electrodes.

PLANT FOR HANDLING ORES.—No. 722,425; G. H. Hulett, Cleveland, Ohio.



Ore handling plant, comprising loading device, two sets of traveling bins to be moved adjacent to loading device for ore, and coke and limestone, scale lorry disposed between sets of traveling bins into which bins discharge, skip arranged to receive material from scale lorry and carry it to top of furnace.

AERIAL TRAMWAY.—No. 722,557; J. N. Bellwald, Trenton, N. J.



In aerial tramway, combination of fixed towers, saddles pivotally mounted upon towers, track cable passing over saddles, which automatically incline to conform to deflections of cable, means for normally maintaining saddles at prescribed angles to towers and automatically adjusting them in contact with

cable as latter changes its position under variations in load, and means acting directly on cable and wholly independent of towers for limiting deflection of cable according to load thereon.

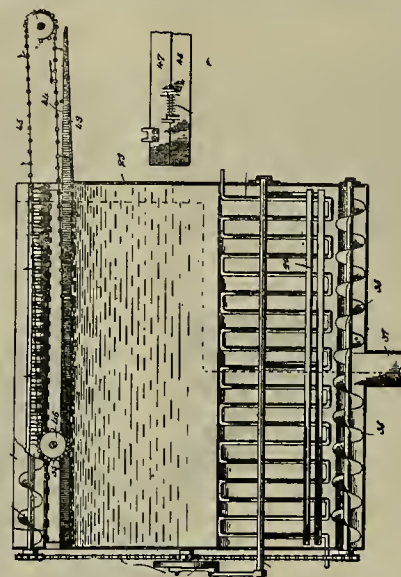
CONVEYOR BELT.—No. 722,252; H. D. Richards, Sutter Creek, Cal.

Combination of belt provided with longitudinal endless walls, along its edges, walls being provided with longitudinal V-shaped grooves therein, with drum having annular V-shaped ribs or projections to engage grooves.

PROCESS OF PRECIPITATING GOLD FROM CYANIDE SOLUTIONS.—No. 722,455; A. Prister, Gradisca, Austria-Hungary.

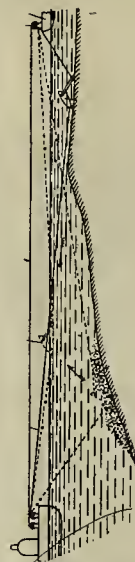
Precipitation of gold and other precious metals from cyanide solutions, such as potassium cyanide, sodium cyanide and bromine cyanide, which consists in acidifying solution, then adding mercurous salt in combination with small quantities of copper salt; adding solution containing zinc salts and small percentage of potassium ferrocyanide discharged from ordinary zinc precipitation boxes.

APPARATUS FOR TREATING ROCK ASPHALT.—No. 722,500; J. S. Downard and B. A. Roloson, Lima, Ohio.



Separator having tank, apron projecting out approximately horizontally from top thereof, conveyor moving over top of tank and apron, scrapers carried by conveyor moving therewith over tank and apron to skim asphalt from tank over apron, scrapers being formed of relatively stationary sections fastened to conveyor and yielding mounted on stationary sections.

DREDGING MACHINE.—No. 722,595; W. W. Lea, Iron River, Wis.



In dredging machine, combination with mechanism for alternately pulling scoop in opposite approximately horizontal directions, scoop provided with downwardly inclined legs whereby, under such alternating stress, it will be caused, by frictional contact with water, to descend in inclined forward direction under forward stress and to ascend in inclined rearward direction under rearward stress.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The Nome Gold Digger says much work is being done on Peluk creek this winter and there are more steam thawers within the radius of half a mile than any other part of the district. Five of the seven thawers there are in a direct line nearly parallel with the beach and about 1½ miles back. The best pay is found in strata of ruby sand varying in thickness, the formations indicating a beach deposit. This is thought to be the same beach that has been discovered on Hastings creek.

Superintendent Day of the Mansfield G. M. Co., on McGinnis creek, near Juneau, says he has had surveys made of their placer ground and lines run for the flume and pipe line that will be put in this spring.

Manager A. B. Iles of the Tanana M. & E. Co. will begin development work this spring on their copper prospects on Nebisina creek, a tributary of Nebisina river, at a point near the watershed between the two branches of the Tanana.

F. Hammond, superintendent of the Sheep Creek M. Co., reports fifty men at work on their mines. The company is putting in a heavier compressor. The mill has been crushing ore all winter.

T. H. Ellis, president of the Yellow Jacket M. Co., operating at Windham bay, near Juneau, says their mill capacity will be increased to eighty tons daily. Water power is used. The Yellow Jacket ore averages \$15 per ton, free milling. Mr. Ellis is also manager of the Detroit-Alaska M. Co., with placer diggings on Windfall creek, where he will put in 2000 feet of hydraulic pipe this spring. A sawmill has been installed and is sawing lumber for buildings and flumes.

ARIZONA.

The following companies were incorporated in this Territory last week, says the Bisbee Review: The Chloride G. M. Co. at Chloride, Mohave county; La Republica del Sur at Tucson; the Promontorio Con. M. Co. at Nogales; the International Investment Co. of El Paso, Texas, at Phoenix; the Gold Producers' Trust Co. at Phoenix; the Mexican Hydraulic G. M. Co., principal offices at Tombstone, Ariz., and Alta, Sonora, Mex.; the Lang Craig G. M. Co. of Phoenix, Ariz., and Milwaukee, Wis.; the Great Northern Oil Co. of Prescott, Ariz., and Detroit, Mich.

COCHISE COUNTY.

The Chicago group of claims, between the Uncle Sam and the White Tailed Deer groups, near Bisbee, has been sold to C. Chynoweth of Calumet, Mich., and the Wolverine & Arizona M. Co. formed with J. Daniel, president.

GILA COUNTY.

Superintendent A. C. Sleboth reports a strike of ore made last week in drift A on the 250-foot level of the Arizona & Hancock Co. mine, on the Mineral and Pinto creek divide, near Globe. The ore is chalcopyrite, assaying 20% copper, averages 30 inches in width and had been followed for 40 feet. Sinking has been resumed and the shaft will go down 200 feet more before another level is run.

D. M. McFarland and C. C. Clark have bonded the J. O. Hill gold mine, a mile west of Payson, for \$16,000. Development work will begin as soon as a steam pump and other necessary equipment can be installed.

The Pinto Creek Copper Co. has bonded the Chaparral group of mines at the head of Pinto creek, near Globe, for one year for \$35,000.

GRAHAM COUNTY.

(Special Correspondence).—The Gold Mountain mines, which have about 2500 feet of development, have on the dump 10,000 tons of ore estimated to average \$10 in gold per ton.

Globe, March 15.

The Johanna, near Metcalf, was sold last week to L. H. Mitchell. The claim adjoins some patented claims owned by Mitchell, upon which he is doing development work.

Leasing has been discontinued on the Arizona C. Co.'s Queen mine at Metcalf, and the company have men at work on the property under T. Shirley, superintendent. Ore shipments will be begun by May 1st.

The Shannon Copper Co., operating near Clifton, has resumed operations. The concentrating plant has a capacity of 500 tons daily. A pumping plant has been installed, says the Bisbee Review.

MOHAVE COUNTY.

At the Gold Roads camp, in the San

Francisco district, 23 miles from Kingman, the Gold Roads M. Co. have a gasoline hoist and air compressor set up at their shaft, says Superintendent C. A. Stevens; and they are installing a mill. The ore will be hoisted, handled by gravity through the crusher into the cars which will carry it to the mill, several hundred feet. Ore will be crushed at the mine to 30-mesh—at the mill, will be dried and run through rollers and crushed to 60-mesh, thence elevated and screened, taken to cyanide tanks, agitated and filtered. Power will be obtained from crude oil gas engines—seventeen being used in and around the plant.

PINAL COUNTY.

(Special Correspondence).—Globe promises to be a lively camp owing to development of the smaller properties. The new ones worthy of mention are the Copper Hill, adjoining the Old Dominion, and the Arizona-Boston Copper Co., which adjoins the United Globe. The latter is sinking two double-compartment shafts, one of which is in good ore at 150 feet.

Globe, March 12.

(Special Correspondence).—There is a well-defined anticline running about north and south in Riverside district, and in a shale formation dipping slightly to the east there is evidence of oil.

The Plural Paraffine Oil Co. has a well down about 1100 feet and has penetrated the formation down to the shale, which the well is now in. On reaching the shale they struck gas and a seepage of oil. They are making about 10 feet a day drilling. Several companies are in the field. The Sunshine Paraffine Oil Co., of which L. V. Navarro of Tucson is president, is about to put up a rig for operations.

There are reports of the Gila Valley, Globe & Northern Railroad extending from Globe to the Black Warrior Copper Co.'s mines. The Black Warrior is building an additional leaching tank of 300 tons and expects to start leaching about April 15.

The Troy mines at Troy have struck a body of ore the past week.

Globe, March 12.

(Special Correspondence).—J. P. Coplen, superintendent of the Pacific Mining & Metals Co., is with Kansas City men at their property in the Catalina Mountain district.

Globe, March 13.

The N. H. Melior gold claims in Saddle Mountain district, near Dudleyville, have been sold to G. B. Chittenden. He has also taken a bond on 600 acres of coal land in Deer Creek coal basin, near Dudleyville, and has men at work reopening an old prospect shaft down 80 feet, and will resume sinking.

SANTA CRUZ COUNTY.

G. W. Crowe, manager of the Arizona G. & C. Co., says they will install a 50-ton concentrating plant at Salero, 34 miles from Nogales. It will be erected at the Trenton mine, one of the group. The ores carry gold, silver and copper.

YAVAPAI COUNTY.

At the Val Minto mines, in Mint Valley section, 14 miles northwest of Prescott, seventeen men are at work, and grading is being done for a 10-stamp mill. At the 100-foot level on one of the claims a crosscut has opened up a ledge 14 feet wide, carrying values in gold.

L. Thomas, F. & F. Gibbons, owners of the Contention group of mines, near Del Pasco, Bradshaw mountains, southeast of Prescott, have installed a 5-stamp mill in Ash Basin, which is running on ore from the Contention. The Contention is the first south extension of the Old Reliable. A tunnel 665 feet in length, on the vein, cuts two shoots of ore, each 100 feet in length, averaging 18 inches wide and \$15 free gold per ton. There is a raise from the tunnel level to the surface 155 feet. A winze from the tunnel, 60 feet deep, shows 22 inches of milling ore. At Crowned King mine, in the same district, work is being done for installing a plant to work the tailings from the mill, which will have a capacity of 60 tons per day, and will save the zinc as well as gold contents of the tailings.

R. H. Palmer of Duluth, Minn., says development work will be resumed on their group 12 miles west of Frog Tanks, below and south of Castle creek. There is an incline shaft 150 feet deep, sunk on the vein, and considerable surface prospect work done.

C. C. Stuke reports having put the hoist in place on the Bodie mine, near Jerome, and has three shifts at work on development. He intends to sink the shaft to 500 feet and at the same time drift and crosscut from the present level.

It is reported the new shaft at the United Verde at Jerome will be sunk to such a depth, and from it new levels opened, as to make it practically the outlet of a new mine, thus avoiding the danger of another shut down should the fire in the older

workings take a fresh start, says the Jerome News.

E. D. Treadwell reports the Hackberry mine, near Mayer, has been unwatered, ten weeks being required to complete it. Ore is opened up on the 300 level.

CALIFORNIA.

AMADOR COUNTY.

The Ledger says there is an abundance of water for mining purposes around Volcano and hydraulic work is being done. Three claims are in operation, under Baron Bros., Gillick & Canvin and Marsino Bros. Superintendent J. Oldfield says he has men at work on the Two Channel mine.

The Dispatch says the Shenandoah M. Co. has opened up an 8-foot body of quartz, and it is proposed to install a mill. At the Edinburg mine, near Pine Grove, the hoist is completed and sinking resumed. They will go down 200 feet, says Superintendent D. Fisher.

BUTTE COUNTY.

The Big Butte M. Co., near Forest Ranch, will enlarge their flume and ditch, says the Chico Enterprise.

The Oroville Register says that the Cardella tracts of 57½ acres, near Oroville, have been bonded to Chicago men at the rate of \$3000 an acre. Work on the dredger to mine the lands will begin by October 1st. The Cardella tract is covered by an orange orchard.

CALAVERAS COUNTY.

The Continental mine, near West Point, closed down last week for a short time, says the Prospect.

Work will be resumed on the Parnell mine, near San Andreas, with H. S. Messer as superintendent.

The W. & W. Mobley mine, on the Welch ranch, near Milton, have installed a 5-stamp mill. The shaft is down 400 feet and an 8-foot vein of ore, averaging \$18 per ton, and carrying sulphurets, has been opened up.

The Angels Record says a pole line will be erected by the Standard Electric Co., from Angels to the Royal mine at Hodson to transmit power for the mill of the Royal Con. M. Co.

The Gwin mine is soon to introduce mechanical haulage in the lower levels of the mine, whereby it is expected to materially reduce the cost of underground transportation of ore and materials.

J. E. King has taken a working bond for one year for \$3000 on the Gold Standard and Louisiana quartz mines, on the Mokelumne river 1½ miles northeast of Mokelumne Hill and adjoining the Easy Bird mine. The working tunnel is being driven ahead and is showing a 5-foot vein of milling ore. At the Easy Bird, grading for a 10-stamp mill is in progress.

The Star of the East G. M. & M. Co., of Rich Gulch, has cut the eastern extension of the Iowa vein and is drifting for the pay shoot. As soon as this is reached a 200-foot upraise will be made and ore hocked out. The Star of the East has a working arrangement with the Iowa mine whereby they use the Iowa tunnel, a saving of 400 feet of crosscut tunnel. The Iowa as well as the Star of the East mines propose the erection of a mill, says the Chronicle.

EL DORADO COUNTY.

At the Karolyi mine, near Kelsey, the whim is in operation and the shaft is being sunk at the rate of 2 feet per day.

At the Levitt Con. mine, near Kelsey, the power plant and compressor are in operation and the main tunnel will resume driving to the vein.

The Patrick-Schulze ditch, near Placerville, is completed around Mt. Murphy, and the mine is in operation.

FRESNO COUNTY.

The El Zumo Puro Oil Co. struck oil in their second well last week, near Coalinga. J. Outler is superintendent.

The Standard Oil Co. is laying a pipe line from the Coalinga field which will connect with their line from Bakersfield to Point Richmond at Mendota.

HUMBOLDT COUNTY.

The Orleans Bar G. M. Co. are working their group of placer mines near Orleans.

INYO COUNTY.

(Special Correspondence).—The Troeger Bros. have six men at work on the Morning Star (Dumphy mine). A gasoline hoist was placed at the end of a 400-foot crosscut tunnel, 250 feet below the surface, and the winze deepened from 100 to 225 feet, the depth of the proposed lower crosscut tunnel which will be driven 700 feet to connect, and will cut the entire Cerro Gordo mineral zone. In sinking, a blind shale contact and an 8-foot vein carrying values in gold and silver were encountered. Double shifts are drifting at bottom to reach the high-grade ore extend-

ing down from upper workings. No ore is being stopped or shipped, it being the intention of the owners to develop the property before building a reduction plant.

T. C. Boland has a 10-horse team hauling lumber and machinery from Keeler to Cerro Gordo for a concentrating plant to work the slag and mine dumps of the old Union property, and is also putting the pumping plant and pipe line which supplies water to Cerro Gordo in repair.

P. Clinton has two carloads of good-grade ore sacked and will ship soon.

There is still considerable snow in Cerro Gordo.

E. R. Hamilton is driving his crosscut tunnel to tap a large ledge, 350 feet deep, from which shipments of high-grade ore were made in the early days.

Cerro Gordo, March 13.

The 8-stamp mill of the Cecil R. M. Co., near Ballarat, is in operation and crushing ore from the Santa Rosa mine.

KERN COUNTY.

At the Buckboard mine, near Randsburg, C. Adams, superintendent, says he has men at work drifting on the 150 and 200-foot levels.

Spangler Bros. are hauling ore to the Phoenix mill from their mine near Garden Station.

The Baltic 10-stamp mill in the Stringer district, near Randsburg, has been running continuously since it was installed in November, 1902, excepting for the monthly cleanup periods, says Superintendent W. H. Wynn. The main shaft is down 225 feet, with a 50-foot ledge. Three levels are being worked and twelve men are employed—single shift.

At Kern river, near Bakersfield, the Mecca Oil Co., which has had four wells idle for a year past, is putting them on the pump again, says the Reporter.

The Aladin Oil Co., near Bakersfield, is finishing its No. 3 and is building the rig for No. 4. This company will drill twelve new wells, and is pumping those wells already completed.

The Clairemont (Union Oil Co.), near Bakersfield, is erecting rigs for four additional wells, making eleven in all.

LASSEN COUNTY.

The labor difficulties at the Golden Eagle mine of the Hayden Hill M. Co. are reported to have been amicably adjusted and work resumed.

LOS ANGELES COUNTY.

The Home Oil Co., near Whittier, has finished No. 1 well and began pumping it last week.

MADERA COUNTY.

(Special Correspondence).—The Texas Flat M. Co. have bought of the Westinghouse Electric & Mfg. Co. one 75 K.W., 2200-volt, three-phase, 60 cycle, A. C. generator, 720 R. P. M.; one 187 K.W., 125-volt, D. C., M. P. exciter, 1800 R. P. M.; one type "8" switchboard panel; one 40 H. P., type "C," three-phase, 400-volt induction motor, 850 R. P. M.; one 20 H. P., type "C," three-phase, 400-volt induction motor, 1120 R. P. M.; one 10 H. P., type "C," three-phase, 400-volt induction motor, 1120 R. P. M.; three 30 K.W., O. D. type, oil insulated, self cooling, lowering transformers, converting from 2100 volts to approximately 420 volts; one 3 K.W., O. D. transformer for lighting circuit, converting from 2100 volts to approximately 105 volts, and the various accompanying details of electrical equipment. The generator will be installed about 3 miles from the mine and will furnish the power necessary to operate a 20-stamp quartz mill, with rock breaker, concentrators, etc., and will also run two hoists.

Madera, March 15.

SANTA BARBARA COUNTY.

J. B. Treadwell has bought 200 acres on the Casimira ranch, near Casimira, and will begin development work for oil.

SANTA CLARA COUNTY.

The Alherta Oil Co., having a lease on a portion of the Sargent tract, near Sargents, has erected a derrick and has begun drilling.

SHASTA COUNTY.

The Texas mine in Old Diggings district, near Redding, is temporarily closed down due to the gearing on the electric hoist breaking. Shipments of their gold quartz ore to Keswick were being made.

The Courler says it is reported the Spanish mine, near Shasta, will be started up in April. There are hoisting works and a 10-stamp mill on the property.

Dredging operations were begun this week on the Wynn placer at Horsetown, on Clear creek, being operated by electricity. The company has options on several farms adjoining the Wynn and expects to plow them up for the gold the soil contains.

SISKIYOU COUNTY.

Superintendent C. W. Tyrer of the Tyrer mine, near Hornbrook, says he will

resume operations at both mine and mill this week.

The Jillson mill, near Yreka, has resumed crushing ore and seventy men are at work in the mine and mill.

The Commodore mine, at Barkhouse creek, will be opened up by Milwaukee men, says the News.

The shaft house of the Morrison & Carlock mine, in Quartz valley, near Fort Jones, was destroyed by fire last week.

SISKIYOU COUNTY.

The Deadwood Placer M. Co., 14 miles west of Yreka, has a bank of gravel 18 feet deep opened by a 40-foot breast. There are 2000 inches of water available under 250 feet head. It is intended to hydraulic the coming season. Superintendent C. W. Knox states that the gravel pans from surface to bedrock. Seven men are employed at present.

Brokaw & McLean are running their hydraulic mine in Quartz valley, with an abundant supply of water at present, operating the giants and elevators. Their quartz mill in Hull gulch will be started up next week as soon as their air compressor is repaired.

TRINITY COUNTY.

(Special Correspondence).—At the Dorleska mine, there has been no interruption of work during the winter, either in the mine or mill. The vertical, double-compartment shaft has been sunk 120 feet additional, and the fourth level has been started at a depth of 300 feet from the surface. The mill has made a regular output of bullion, and the new battery of five stamps has been set up and will be started next week, after which the mill will have a capacity of twenty tons per day. The Dorleska vein continues to look well, and on the third level varies in width from 4 to 14 feet.

Trinity Center, March 18.

The Yellow Rose of Texas mine, near Trinity Center, near the headwaters of Coffee creek, and adjoining the Dorleska mine on the south, has been bonded to the J. J. Chambers Co. of Redding. A 1000-foot tunnel will be driven to cut the ledge at a depth of 350 feet below the present workings. The mill and hoisting plant will be enlarged. The property consists of eleven locations and millsite, embracing 220 acres and 640 acres of patented land.

TUOLUMNE COUNTY.

Manager M. B. Kerr, the Jumper Gold Syndicate of California, Ltd., operating at Stent, says the reports to the effect that operations at the Jumper mine had suspended are untrue. The Golden Rule is closed down pending the connection (200 feet yet to run) of the two mines by the drift on the 500-foot level of the Jumper, and the addition of forty stamps to the Jumper mill to handle the ore from the Golden Rule. The Jumper is running full banded, and sixty stamps are dropping in the mill. The local California organization has been discontinued, and its property transferred to the above named company whose head office is in Glasgow, Scotland.

D. Wiget has bought the Hold Fast mine, 1½ miles from Jacksonville.

The Rose Creek M. Co. has deeded to E. A. and J. O. Hayes of Santa Clara, Cal., the Star mine and its other holdings east of Columbia.

E. A. Thissell of Lowell, Mass., has bought the Starr King and the Sherman quartz mines, near the North Fork of the Tuolumne river, 3 miles from Carters. C. A. Holland is superintendent.

The Grizzly mill resumed last week and twenty stamps are dropping on ore from the shoot opened up last month, says Superintendent W. R. Hall.

It is reported that the Starr King mine, 3 miles southwest of Carters, will be reopened, with C. A. Holland superintendent.

At the Norwegian mine, near Tuttle-town, fifteen men are at work and the 10-stamp mill is running.

Superintendent F. Chappellott of the Mohican mine, near Groveland, has thirty-five men at work.

At the Pinon Blanco mine (the Ward), on the Mother Lode, 3 miles from Coulterville, at 600 feet in the tunnel last week a ledge of free-milling gold ore was struck from the hanging-wall side, says Superintendent W. T. Stephens.

At the McAlpine mine of the McAlpine G. M. & M. Co., near Big Oak Flat, the two-compartment shaft is being sunk from the 300-foot point to 500 feet, at which point they will crosscut to the vein, says Superintendent S. E. Rigg. A fine gallows-frame has been erected and a hoist will be put in.

YUBA COUNTY.

The Shakespeare, Byron and Milton quartz claims in New York township, near Woodleaf, have been sold to C. J. Nickerson. Work will be resumed this month and machinery installed.

COLORADO.

The mineral output of Colorado for the year 1902 is placed by H. A. Lee, State Commissioner of Mines, at \$44,708,895.83. There are thirty-nine counties enumerated. The metals produced were gold, silver, lead, copper and zinc. The gold output reached \$28,577,117.40. The counties producing over \$500,000 each were: Boulder \$538,701.54, Clear Creek \$930,480.72, Gilpin \$1,551,035.46, Lake \$1,203,924.15, Ouray \$2,420,725.71, San Juan \$1,524,226.47, San Miguel \$2,007,656.43, and Teller \$16,931,892.51. The silver output was valued at \$8,315,192.29. The principal counties producing silver were: Clear Creek \$687,152.48, Lake \$2,942,792.61, Mineral \$1,003,544.32, Ouray \$411,988.37, Pitkin \$1,597,895.52, San Juan \$437,154, San Miguel \$551,143.42. The lead production was \$4,325,484.29, and the principal producers were: Hinsdale \$252,838.02, Lake \$1,605,227.74, Mineral \$378,065.36, Pitkin \$1,016,184.37, and San Juan \$313,308.24. The copper production reached \$1,006,108.31. The two largest producers were Lake county, \$310,359.42, and San Juan, \$358,070.08. Zinc was produced to the value of \$2,544,993.48. Lake county was the chief producer of this metal, outputting 47,637,490 pounds, valued at \$2,305,654.62.

The News says the Denver office of the American S. & R. Co. has authorized its agents to announce that the price paid at smelters for lead in ores will be \$3.75 per 100 pounds, being an advance of 25 cents per hundred over the smelter rate for 1902.

BOULDER COUNTY.

The Mile High M. & M. Co. of Denver has bought the Caryl group, near Sugar Loaf.

The Northern Coal & Coke Co. started last week to drill near the Acme mine, south of Louisville, to test the second vein of coal before putting down a new shaft. The company will begin work on the new shaft April 1.

The Fox & Patterson mine, on the Harper place, west of Louisville, is down 200 feet, and expects to strike the coal at 225 feet deep.

CHAFFEE COUNTY.

Manager T. E. Ritnour of the Cleopatra mine, east of Cameron mountain, near Whitehorn, says he will put in a hoist, air compressor, pumps and boilers. A drift is being run in at a depth of 100 feet to make air connections with an old working shaft.

CLEAR CREEK COUNTY.

In the annual report sent out by the Kelly Tunnel Co., operating at Georgetown, are shown the expenses itemized as follows:

For mining claims.....	\$19,524.54
For labor and superintendence..	23,689.24
For tools and mining supplies...	15,953.82
For plant, machinery and supplies.....	23,639.52
For real estate.....	765.03
For office fixtures and furniture..	282.24
For accounts payable.....	4,024.62
For taxes, commission and expense.....	8,976.43
For accounts receivable.....	139.87
Total.....	\$86,995.31

During the year the tunnel was driven 63 feet by hand before the machine drills were put on. Power was installed May 17. The total distance for the year was 1629 feet. The average per month for machine work after July 1 was 221 feet. The best run was in November, when 260 feet were broken down. The cost per foot, average, is estimated at \$23.31.

The East Red Elephant Co. at Lawson have begun work on their tunnel, which is to tap Red Elephant and other veins in Red Elephant mountain.

The Freeland Extension Co., near Idaho Springs, has resumed operations after a shut-down pending the installation of an air compressor. Manager Wilson says the company will drive the levels ahead in the part of the group, connecting with the Freeland, while in the older workings the stopes will be released in blocks. All of the levels of the Freeland mine to a depth of 900 feet were driven up to the end lines of the Extension and a perpetual right of way given to operate through the Freeland adits.

The Gomer M. Co., operating on Spring gulch, near Idaho Springs, are putting up a hoist. Sinking on the extension of the Fraction and Kitty Clyde vein will begin.

W. E. Renshaw, manager of the Gem Con. Co., near Idaho Springs, says work will resume on the Gem vein through the Newhouse tunnel.

The Donaldson Mountain G. M. Co. mines have been sold for \$185,000 to W. M. Phillips and A. T. Lucas of Chicago, Ill. The group covers the ground between the Coronation and Centurion groups on Donaldson mountain, near Idaho Springs, and comprises forty claims. The new owners will begin development work next week,

continuing the Golden Hill tunnel, which is in 300 feet, to its terminus, 2700 feet distant. The bore will cut the Champaign, Freeland and other veins. The greatest depth attained in the tunnel is 1300 feet.

Experiments are being conducted by the managers of the Gold Dirt, Gold Fissure and Republic groups of mines at Empire, to determine the value of electric drills as a factor in mine development in this locality, says the Record.

CUSTER COUNTY.

G. W. Avery, having a lease on the Elematah claim of the Aburdix G. M. Co., near Custer, has struck at a depth of 160 feet a 12 inch vein of ore that runs \$500 per ton in gold and silver, with some copper. The shaft, which is 400 feet deep, is being unwatered.

DOLORES COUNTY.

The Geyser mine, 1½ mile below Dunton, will be developed on a larger scale and output increased, says W. S. Evans of Milwaukee, Minn., part owner. A mill will be installed. L. Gilligan of Dunton is manager.

The mill of the Mt. Goram M. Co. at Dunton resumed operations last week.

The 50-stamp mill at Ophir Loop of the Ophir Con. M. Co., W. S. Buckley general manager, is treating an average of 150 tons of ore per day. The ore, coming from the Ida and Verdict veins, is free milling gold, the balance of the output being from the Silver Bell and Butler veins, which carry 5 feet of concentrating material, which returns values in gold, silver and lead at the smelters. One carload of concentrates is sent out daily.

FREMONT COUNTY.

The Rocky Mountain S. Co., whose works are in Florence, on the Arkansas river, has made an assignment for the benefit of its creditors.

GILPIN COUNTY.

The Progressive M. & I. Co. has a lease and bond on the West Wyandotte group, in Leavenworth gulch, on the south slope of Quartz hill, near Central City. The main working shaft of the group is the West Wyandotte, down 600 feet, and has 200 feet of water in it. Pumping operations will begin next week, says W. L. Cooper of Denver, vice-president of the company.

The Freedom mine, on Winnebago hill, near Central City, is being operated by the Colorado Tellurium G. M. Co., of Paterson, N. J., men, under lease and bond. Machinery has been installed to sink the shaft to 1500 feet, and the workings are being unwatered. R. Borchardt is superintendent and manager.

The Maine property, southeast of Central City, is being reopened by the Sydenham M., M. & L. Co. under lease and bond. S. W. Brereton of Denver is superintendent.

The Pittsburg Con. M. & M. Co., J. R. Anderson president, has bought for \$100,000 the Gold Dirt group at Perigo, 2 miles from Rollinsville.

GUNNISON COUNTY.

C. W. Swanson of Denver, superintendent of the Rustler G. M. & M. Co., operating on Rustler mountain, near Crested Butte, says they will have a mill in operation early in the spring at Gothic. A 100-foot contract will be finished by April 1, making the Howard tunnel 500 feet deep. The last assay of ore from this tunnel shows values in gold, copper and silver. This company is made up of Illinois men.

It is reported work will be resumed on the Midland mine, near Vulcan, and a tunnel is to be run from Beaver creek, in under the present shaft. The Midland is showing milling ore beside some high-grade material. The operators say the body of low-grade ore will warrant the erection of a cyanide plant.

At the Good Hope mine at Vulcan they are shipping ore from the 500-foot level which returns \$6000 per car, says L. Weiss of Del Norte, principal owner. The ore is a schist, carrying copper, telluride of copper, with himself and gold. The shaft is to be sunk to the 700-foot point.

LAKE COUNTY.

The Sharp G. M. Co., operating on placer ground at the western rim of Leadville basin, near Leadville, struck blue lime last week in a drift 50 feet from the surface, and it was found to be pitching toward the east at a sharp angle, says Manager Sharp.

Manager Dean of the Valley M. Co. says operations will be resumed at the Valley mine, near Leadville.

The Uintah placer, in lower California gulch, near Leadville, will be worked next summer. The territory extends from the lower part of Stringtown down to Malta. I. B. Porter of Denver is manager.

PARK COUNTY.

The Damascus M. & M. Co. have bought eight claims (eighty acres) on Loveland mountain, above Alma, and will begin op-

erations this month. The group lies between the Fanny-Barrett and Kansas Con. mines. They also own ground adjoining the Little Johnny mine. P. A. Phillips is superintendent.

SAN JUAN COUNTY.

The Gold Tunnel & Railway Co. (the Highland Mary properties) in Cunningham gulch, near Silverton, will begin ore shipments next month. At present thirty men are employed on development work. The main tunnel is being driven ahead, and is in 6100 feet. At 1000 feet from the breast a raise is being made which will be 450 feet and will connect with a crosscut being run from the Blowout. It will take about 700 feet more to complete this work, when this improvement will provide ventilation for all parts of the mine, besides being used for transporting ores. No ventilation in this tunnel caused them to close down all work upon their ore bodies until these connections are made. A mill of 100 tons capacity is ready for operation. Electric lights are furnished from a plant at the mill. C. W. Everett of Toledo, O., is president of the company. The Anglo-Saxon crosscut, up Cement creek, is in 2100 feet and is being driven under Superintendent W. Grossklau.

The tunnel on the Waterfall claim, in Needle Mountain district, near Silverton, is in 325 feet, and is showing 2 feet of ore that assays \$15 in gold and thirty ounces silver. The ore can be successfully treated by the cyanide process, and it is the intention of the management to put in a mill this spring.

The Yuba Bill group of mines, near Eureka, have been sold for \$60,000 to A. W. Hall and F. Jones of Waterville, Me., who hold the title to the property for the use and benefit of the Stony Gulch M. Co. This group is in the Eureka district, on Bonita mountain, adjoining the Gold King Con. group. Work will begin April 1.

The Big Trippe crosscut tunnel at Howardsville is going ahead at 1½ feet per shift of eight hours. This tunnel, which is 6x8 feet in the clear, is being run to cut the Charter Oak group on King Solomon mountain at a depth of 500 feet. G. D. Cook is superintendent.

Work will be resumed on the properties formerly owned by the Eclipse M. & S. Co. near Animas forks, near Silverton, on Mineral and Temptation mountains. The veins are from 4 to 7 feet wide, except in the Eclipse, which is 60 feet wide, with a pay streak 4 feet wide, containing galena in a quartz gangue, with milling values in silver and gold. In connection with these claims are two millsites, near the Animas river, with ample water supply for milling purposes. A crosscut will be run to cut the Eclipse vein in a new place to further test the extent of the ore bodies and to see if it will justify building a mill.

SAN MIGUEL COUNTY.

I. B. Innes of Saw Plt is working on a group on the edge of the district. He has driven three levels on the vein and the lower one is in 330 feet. The ore averages \$20 per ton in gold and silver, according to mill test. It is proposed to install a mill and tramway this spring.

SUMMIT COUNTY.

Manager Berlin of the Hamilton mine, near Breckenridge, says he will double the size of their 10-stamp mill.

On the east side of Gibson hill, near Breckenridge, the Providence & Colorado Co., H. S. Whitehead manager, sinking a shaft on the Teller lode, are using a whim for hoisting. Last week, at 120 feet, a body of gold-lead ore was struck. A flow of water is bothering, which will require the placing of a steam pumping and hoisting plant.

TELLER COUNTY.

At the Hawkeye, at the head of Bernard creek, between Cripple Creek and Gillett, an air pipe line is being laid from the Lincoln mine and development work will begin next week.

The Horseshoe, Londonderry, Fairview, High Tide and Bertha lodes of the Bull Hill Con. Co., on Bull Hill, Cripple Creek, have been sold to the United Mines Co.

The C. K. & N. property, at Cripple Creek, has been closed down temporarily, owing to the water situation. The lessee is baling out the mine and will install pumps if the flow does not prove too heavy. The present difficulty is supposed to be caused by the setback from the El Paso mine. Pumping operations are practically suspended throughout the entire district, and with the exception of the Vindicator and Stratton's Independence all pumps are standing idle and waiting for the drainage tunnel to tap the water course. There are quite a number of mines forced to handle a small amount of water that accumulates during the twenty-four hours, but the only pumping to speak of is being done by the two mines mentioned. At the Vindicator, during the month of February, they raised 18,462,000 gallons of water. In this case the company makes a profit off the water, as they sell a

portion of it to the city of Victor for domestic purposes. The El Paso Con. Co. is pushing the work of bulkheading and will suspend all pumping and permit the water to rise and flow out of the Standard tunnel level. Bulkheading in the bottom level, where the men are at work in driving the drainage tunnel, forces the water to rise up through the vein, principally the C. K. & N., until it reaches the tunnel, where it will flow out and down the creek. The Gold King is pumping a few hours each day.

The Gould Con. Co. recently granted a lease on the Rhinoceros and Nil Desperandum claims on Raven hill, near Cripple Creek, to the Pueblo & Cripple Creek Railway Co., operating the Ophella tunnel, which is expected to reach this ground by April 1. It is the intention of the lessees to explore the group from the tunnel level, which is 800 feet below the surface. The greatest depth to be attained by the tunnel will be 1500 feet.

The Cripple Creek Times says the pay roll of February for the mines and mills of Cripple Creek district, which was distributed on the 10th inst., showed an increase over January. There was a total of 6286 men employed, receiving an aggregate of \$654,778.21.

The Golden Cycle Co. at Cripple Creek has granted a lease on the Dalzell and Wilson workings of the Anna J. claim to McGarry & Huxley, who will begin operations next week. The lease extends from the surface down to 300 feet.

The Portland mine, at Victor, is temporarily closed down pending repairs. On the 10th inst. an unknown accident caused the hoisting engine at No. 2 shaft to "run away," wrecking the head frame; the flywheel went to pieces; the up-coming cage dropped back into the shaft, followed by 2200 feet of cable, but jammed at the 300-foot level.

IDAHO.

BANNOCK COUNTY.

Manager W. Beddlg says he is making the preliminary survey of the ground at Pocatello on which his company will install a smelter and refinery of 150 tons daily capacity. The company is composed of Pittsburgh men.

BOISE COUNTY.

The Idaho-Colorado G. M. Co., Ltd., has been incorporated at Idaho City; M. Gee, H. L. Fisher, J. A. Fuhs, W. H. Yankee, W. S. Herring and J. A. Hinebaugh. The company owns a group of claims in Neal district, adjoining the Overlook group, and is operating a group of claims in Pearl district. It is the intention to extend operations to Basin properties during the coming season.

The Chile mill at the Overlook group of mines at Neal is in operation. It has a capacity of 125 tons per day.

The Elkton group of quartz claims, near Neal, has been bonded to the Overlook Co. for \$25,000. Work will begin this spring.

ELMORE COUNTY.

The General Pettit mine, near Atlanta City, has been sold to E. Holter of New York for \$130,000.

IDAHO COUNTY.

But for the shortage of powder there would have been a larger amount of development work done in Thunder Mountain district this season, says B. F. Goldman in the Intermountain. About seventy-five men are at work for wages, besides those working their own properties.—The Gold Reef Co., 5 miles above Roosevelt, on Monumental creek, has crosscut its vein for 120 feet. Several men are at work there on two shifts.—The Dewey mill has resumed.—The Sunny-side tunnel is in 140 feet.—The Glasgow and Dundee group, on Profile creek, has been bonded to Joplin, Mo., parties. It is expected that the company will put in a road from Warren this year and install a reduction plant.

G. J. Wright and W. A. Scott, operating the Kimberley and Jewell groups of gold mines on Bear creek, near Weiser, say that next week they will have thirty-five men at work and extensive development begun. A 10-stamp mill will be installed.

It is reported that C. J. Perkins of Cripple Creek, Colo., has bought the Sunshine group and the Climax claim, adjoining the Fairview mine, in the Thunder Mountain district, near Roosevelt. Perkins intends to install a 20-stamp mill.

SHOSHONE COUNTY.

J. Goodrich, resident manager of the Highland Chief, on Pine creek, southwest of Wardner, reports the pay streak opened up 8 feet wide, with the entire vein 18 feet wide; assays gave \$20 gold, nine ounces silver, 15% lead and a trace of zinc. He says a concentrator will be erected in the summer.

A 3-foot body of milling galena has been struck on the Nine Mile mine, 3 miles

north of Wallace. The company ran a crosscut tunnel and tapped the ledge at 2000 feet, from which point they drifted on the lead and the chute was cut at 400 feet.

The crosscut on the Little Chief silver-lead mine, at Mullan, is in 500 feet, and they expect to cut their vein this week.

LOUISIANA.

LAFAYETTE COUNTY.

An oil gusher was brought in at Anso la Butte on the 6th inst. by Heywood Brothers. This well had been abandoned at first, and the drillers resumed on finding 300 feet of oil in it. The gusher is 5 miles from Lafayette.

MICHIGAN.

HOUGHTON COUNTY.

Superintendent J. Stanton says the Winona Co. owns 1568 acres of mineral lands near Winona which contains about a mile of the Winona amygdaloid, which runs about 12 feet wide. The Winona Co. received \$13,000 for their copper for the month of December, which more than paid expenses. They are sending an average of five 40-ton cars of rock per month to the Atlantic mill, yielding twenty-three pounds of ingot copper per ton; and would send more, but the Copper Range Railroad cannot furnish the equipment.

It is reported the Calumet & Hecla, at Calumet, will close down five of its old heads on arrival of the first boat in the spring and will begin remodeling them at once, not waiting for the heads in the new mill to get in full running order.

President Paine of the Copper Range Con. Co. says they will build an addition to the Champion mill this coming summer to hold two heads. The intake tunnel has been built 30 feet east of the present mill to provide water for the extension. F. I. Cairns, formerly at the Washoe smelter, Anaconda, Mont., has charge of the building of the new Copper Range smelter. The Copper Range track has been completed to Calumet.

Superintendent Hosking of the Franklin Jr. mine, near Houghton, says operations on the amygdaloid lode have been discontinued and work transferred to the conglomerate lode, on which one shaft is down 1600 feet and drifting and crosscutting done. The rock being taken out from this shaft averages 11% mineral containing 63% fine copper. The lode is 20 feet wide. The management has decided to sink a new shaft 1200 feet south of this one. The Franklin Jr. and the Franklin are together shipping 1000 tons of rock daily to the mill, and with the addition of another head of stamps, which will be put in this spring, the production can be increased.

ONTONAGON COUNTY.

Superintendent J. M. Wilcox of the Mass mine at Mass City, in his annual report says the larger part of the new ground has been opened west of B shaft, and 75% of the rock stamped has come from that point, the larger amount of work being done on the Evergreen lode. The two shoots of copper ground, running from A shaft on the west side, continue to show as good values at the bottom as they did at the sixth level. The width of the shoot is 300 feet. No work has been done on the east side of A shaft. C shaft has been sunk 438 feet on the Butler lode, giving three levels. Drifts are being run east and west on the third level and a crosscut north to the Knowlton lode on the same level. Rock hoisted during the year, 203,769 tons; rock stamped, 152,562 tons, and mineral obtained, 3,273,835 pounds. Total number of new openings during year, 4740 feet.

MONTANA.

BEAVERHEAD COUNTY.

A strike of a 6-foot body of gold ore is reported made at the French Bros' mine at Argenta, 13 miles east of Dillon. The strike was made on the 150-foot level. The mine is owned by G. & T. French.

GRANITE COUNTY.

The Joseph Case group (the Fisher Jack mine), on lower Rock creek, near Phillipsburg, was last week bonded to B. H. Dunshie et al. of Butte.

LEWIS AND CLARKE COUNTY.

In the Blue Cloud district, near Marysville, the Eglene Placer Co. is working three drifts on the bedrock drain from the mouth of Lincoln gulch with twenty-five men. The company also has men getting out timbers for the drain and flumes. It is expected that the drain will be 4000 feet in length before pay gravel is reached.

MADISON COUNTY.

L. D. McCall of the Bismarck Nugget G. M. Co. says they are installing hoisting and other machinery on their mine near Twin Bridges.

MISSOULA COUNTY.

The Tarbox M. Co. is making arrangements for the construction of a 250-ton concentrating mill at the Tarbox mine, near Saltese.

PARK COUNTY.

The Kimberly-Montana G. M. Co. will increase development on their properties in Bear Gulch district, near Jardine. A 60-stamp mill is being built and a 40 stamp mill has been completed. H. D. Andrews of Salt Lake City, Utah, is manager. The Kimberly-Montana Co. is the result of the reorganization of the Bear Gulch M. Co. and the Gold King M. Co. P. L. Kimberly of Chicago is president.

POWELL COUNTY.

T. Hird of Blackfoot City says he is running a tunnel on the Butterfly group of mines, between Carpenter and Basin gulches, 8 miles north of Avon station, on the Northern Pacific Railroad. The Butterfly lead is 40 feet in width and the tunnel is in 225 feet. The ore carries copper pyrites and copper glance, with values in gold, silver and copper. A shipment of ore from the Loraine claim, on the Butterfly lead, carried 30% copper, \$5 per ton in gold and 20 ounces silver.

NEVADA.

ELKO COUNTY.

A 60-stamp quartz mill will be installed on the Nelson group at Mountain City, says Manager Purdum, part owner, with other Eastern men.

The Riddo mines at Edgemont, recently sold to R. W. Purdum of Nampa and H. Russell of Pittsburg, Pa., who have organized a company, are being operated, with L. Bishop as superintendent, and a stamp mill will be installed.

ESMERALDA COUNTY.

The Douglas M. & S. Co. at Douglas has eighteen men at work and the face of the tunnel is in 300 feet, says the Journal.

(Special Correspondence)—The Klondike mining district, 12 miles south of Tonopah, is the center of a field which is being carefully prospected.

From East Klondike may be seen Gold mountain, 6 miles south of Tonopah; Lone mountain, where Lynch & O'Meara are shipping ore; Montezuma, a silver-lead camp; Grandpa, a newly discovered property, and the Blair gold mines of Silver Peak.

Several cars of ore shipped from East Klondike to the Selby smelter averaged 800 ounces silver per ton.

About \$50,000 worth of ore has been shipped from South Klondike, mostly by leasers on 25% royalty. Several small shipments have been made from other properties in this district, but as yet there has been but little development. The formation is lime, shale, quartzite and granite, cut by numerous porphyry dykes. The mines at East Klondike are at contact of the lime-shale and quartzite, those of South Klondike paralleling the granite. The ore is brittle silver, with chlorides and bromides of silver, also galena and carbonate of lead carrying gold and silver.

Several thousand dollars in coarse placer gold have been obtained here by dry washers.

Klondike, Nev., March 14.

LANDER COUNTY.

The Boston & Maine G. M. Co. was incorporated at Salt Lake City, Utah, by W. A. Eckman, C. S. Richardson, C. F. Adams, G. F. Putnam and L. Dunham. They will operate a group of mines 3 miles south of Galena, in Battle Mountain mining district.

LINCOLN COUNTY.

E. B. Scott has bought the Rose Howard-O'Connor interests in the John Flynn group at Newberry mountain, near Searchlight.

The cyanide plant of the Quartette M. Co., near Searchlight, is in operation, says Superintendent Harrington. Two gasoline engines are being installed—one at mine, and one at mill.

Manager W. T. Mitchell has begun operations on the DeLamar Extension G. M. Co.'s group, near DeLamar.

Hoisting was begun at the Mendha mine, near Pioche, last week. Electric drills are being used.

NYE COUNTY.

The Los Angeles, Daggett & Tonopah R. R. Co., with \$7,000,000 capital, has been organized at Los Angeles, Cal., to build a railroad from Daggett on the Santa Fe railroad in San Bernardino county, Cal., to Tonopah. The line of the road will follow closely the old emigrant road northwesterly to Death Valley and thence northward to Tonopah.

The Tonopah M., M. & D. Co. has incorporated at Butler, to construct a mill for the treatment of Tonopah ores; J. L. Butler, Brougher Bros., H. C. Cutting, F.

Golden, W. Douglass, G. Nixon, Crocker & Salsberry and C. E. Knox. A mill will be installed on ground owned by the Midway M. Co.

Superintendent Patrick of the Tonopah Syndicate G. M. Co. at Butler says development work is progressing on this group, which includes three claims and a fraction adjoining the California-Tonopah on the west. The shaft is down 60 feet and a hoisting plant of sufficient capacity to sink to 500 feet will be installed.

The Tule River Placer M. Co. was incorporated at Butler last week. Water to hydraulic the ground will be piped a distance of 16 miles.

At 400 feet northeast of the present breast of the drift, and directly on the course of the vein, the Con. Nevada Co., adjoining the Wedekind, near Reno, is sinking its Anna Belle shaft to intersect the vein on its dip.

The Desert King, of the Wedekind-Desert King group, owned by J. Sparks, is maintaining its output of high-grade ores, which, owing to its value, cannot be profitably treated at the Sparks mill.

At the Molly shaft of the Mizpah mine at Butler a 12 H. P. gasoline hoist was put up last week. The shaft is down 150 feet.

The Tonopah Miner says, through concessions on both sides, the Belmont Development Co. has secured from the Tonopah Co. the right to use the Desert Queen shaft for the development of the Belmont group. A contract has been let to sink that shaft 200 feet below the 614-foot level. A crosscut is being run from the 614 level into the Silver State. The Belmont shaft, on the Belmont claim, 2000 feet east of the Desert Queen shaft, is down 350 feet. A 44 H. P. gasoline hoist is being installed on the Belmont.

STOREY COUNTY.

Manager J. Ryan says 1550 feet of No. 6 three-conductor armored cable will be put in the Union shaft at Virginia City, for transmitting electrical power from the surface to all of the underground workings in the Sierra Nevada. Three 10 K. W. power transformers and two 7½ K. W. light transformers will be installed as soon as the wiring can be done.

OREGON.

BAKER COUNTY.

Mill operations at the Psyche, in the Greenhorn mountains near Sumpter, have been temporarily suspended because of a wood shortage. Development work continues in the mine.

The Standard, Copper Ridge and Willie Boy groups of mines at Quartzburg, near Sumpter, have been consolidated and organized as the Standard Con. M. Co.; with D. L. Killen, E. W. Mueller, C. B. Wade, Z. Houser. A reduction plant will be installed and further development work done. There are twenty-six claims in the merged property, covering Copper mountain, on Dixie creek, a fork of the John Day. The Standard produces cobalt ores.

J. G. English of Danville, Ill., part owner in the Amazon group of mines, near Sumpter, says development work will be continued on the group this season.

The Pacific G. M. Co. of Boston has been organized to develop the Kentucky group of mining claims in the Bonanza district, near Sumpter. They are in the Westfall basin, near the Bonanza mine. W. E. Hurd is manager.

JOSEPHINE COUNTY.

The Oro Fino quartz mine, in Jump-off-Joe district, near Merlin, is to be opened up this spring and a mill installed in the summer, says Manager Chase, of Portland. The Oro Fino has two veins, parallel, and 40 feet apart, and a tunnel, 600 feet in length, taps one at a depth of 125 feet from the surface. A crosscut from this will be run to cut the parallel vein which was the one worked at the surface.

The Golden Drift M. Co. has moved its sawmill near the dam being built by it across the Rogue river, at the Dry Diggings, near Grant's Pass. The dam will be finished next month after which machinery will be installed in time for the beginning of the fall season. This winter the company has had two giants at work in the diggings, using water from Jones creek.

PENNSYLVANIA.

YORK COUNTY.

A find of iron ore is reported in the river hills near Wrightsville. The ore is hematite containing little gangue.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Tinton M. Co. has been organized in Chicago, Ill., to develop a series of veins of tin ore at Tinton, in the western part of the county, near Bear gulch; W. H. and E. W. Noakes, P. B. Weare, with C. Walte as manager.

The Spearfish Co. in February produced

\$23,000. Five days were lost during the month on account of repairs being made to the mill. The amount of ore handled during the month was 4595 tons, and the average value per ton was \$6.02.

The new Hidden Fortune mill on White-wood creek, below Deadwood, will start April 1st. The Colorado Iron Works, building the plant, will operate it thirty days before turning it over to the company. The Hidden Fortune Co. is doing its principal work, says the Black Hills Mining Review, in the Bingham shaft. Development work is progressing on the Lead side of the hill, in the Cambrian. This ore lies in blanket form, near the surface, and is being stripped of the overlying material that it may be mined in open pits. The ore varies in thickness from 4 to 15 feet, and the average of the ore is good. Some of it is rich in gold, while in parts the value is nominal. It is the intention to supply the mill with this ore at first.

UTAH.

BEAVER COUNTY.

Foundations are laid for the power house to supply electricity for a battery of electric drills at the Old Hickory, near Milford. A 20 H. P. gasoline engine will be used and will generate power for ten drills.

IRON COUNTY.

Consulting Engineer J. B. Jenson of the Summit Placer Co., operating in the hydrocarbon regions, near Soldier Summit, says the output of the mine is to be doubled. The product of the property consists of mineral wax, a market for which is found in New York and Germany. An additional extractor is being installed, also an automatic elevator and feeder and an 80 H. P. boiler. With this machinery in place the plant will have a capacity for handling 100 tons of material per day, and will turn out three tons of refined wax. The mineral wax is used in the manufacture of rubber goods. In Germany it is manufactured into a paint, which is applied to hulls of vessels to prevent gathering of barnacles.

JUAB COUNTY.

The proposed consolidation of the Victor and Boss Tweed groups of Tintic district, near Eureka, has been ratified by the stockholders, and E. V. McCune, H. P. Henderson, J. A. Groesbeck, Jr., C. O. Ellingwood, W. S. McCormick elected directors. J. Treloar is superintendent of the consolidated properties, and says he is forwarding to the smelters eight carloads of copper ore a week that nets the company \$16 per ton. The Victor Con. M. Co. is the new name.

A. M. Cannon, president of the Dugway M. Co., says operations will be resumed at their mines at Dugway in Deep Creek district, near Fish Springs, with W. Leatham as superintendent.

MILLARD COUNTY.

H. N. Burns, manager of the Oil City Oil Co., operating at Desert Switch, says he expects to bring in a well between the present depth of 1700 feet and 2500 feet, though the machinery is capable of boring 3000 feet. He says that before the summer is over there will be fifty rigs working in the eastern Utah fields.

PIUTE COUNTY.

(Special Correspondence).—H. L. Mills will develop his Juno claim on Two Mile creek, near Marysvale. The ore carries gold, silver and lead.

The Henry Bradburn Co. is making arrangements to work its property in the North Fork of Cottonwood.

A body of ore has been opened up in the Trapper's Pride.

F. M. Haughey of the Standard group reports ore being taken out.

Marysvale, March 14.

(Special Correspondence).—A strike of gold ore above Ten-mile creek is reported. The property is owned by R. DeWitt and Robbins Bros. of Gunnison. Three shoots of ore have been uncovered within a distance of 1000 feet along the vein. In the shaft is a 10-inch streak of shipping ore, and the balance of the vein, 2½ feet wide, carries gold running from \$5 to \$50 per ton.

The larger portion of this section has been but little prospected.

The Silver King and Gold Queen mines, near the head of Deer creek, have been handed to S. A. King of Provo.

A shipment of two cars of iron ore will be made from the Iron mines, 3 miles from this camp.

Marysvale, March 14.

SALT LAKE COUNTY.

Manager J. B. Jenson says good headway is being made at the Pioneer sampler at Sandy, where machinery is being installed preparatory to putting the plant into commission again. He expects to resume by April 1.

An option on the Panhandle and A.

Stuart groups at Bingham has been given to the Sampson M. Co. for \$25,000.

On the 600 level of the York mine, at Bingham, a vein of ore 1 foot in width has been opened up which carries with it values in lead, silver and copper. The vein was encountered while crosscutting to the contact of the vein, which Manager Orem says is yet 60 feet away.

SUMMIT COUNTY.

The first annual report of the Daly-Judge mine, near Park City, states that the new company now owns 1200 acres of mining ground, with 15,000 feet on the strike of the vein, of which 2500 feet have been partly prospected. The machinery has been overhauled within the year and the mill reconstructed and enlarged to a capacity of 300 tons daily. Since incorporation many improvements have been made in the mine, including the widening and retimbering of the drifts, enlargement of the main shaft, refixing grades, etc., beside the construction of numerous buildings and installation of electric and other machinery. From the operations of the old mill 20,000 tons of zinc "middlings" have accumulated, containing 20% to 30% zinc, beside silver and lead values. This dump has been leased to the Magnetic Zinc Separating Co. of Park City, and this ore, heretofore valueless, will now realize a profit. It is estimated that 120,000 tons of ore are blocked out in the mine.

The Aristocrat M. Co. is incorporated at Park City. The holdings are two claims between the Cincinnati and the Creole groups; T. H. Paul, H. M. Sborn, J. C. Hasson, J. Frankel and G. Ketchum are the directors. The shaft is down 30 feet, and will be continued to the contact at 200 feet.

H. M. Crowther, consulting engineer American Flag M. Co., Park City, says the main shaft is down 340 feet and they are sinking at the rate of 3 feet per day. It will be continued to 400 feet before crosscutting to the ore bodies.

TOOELE COUNTY.

J. Dederichs & Co., operating the Black Diamond mine, near Stockton, report opening up in the north drift on the 150-foot level a 2-foot body of lead carbonates and galena.

The Metallic Hill M. Co. of Salt Lake City has incorporated; D. S. Taggart, J. P. Nelsen, H. H. Green, A. K. Tiernan. The company owns the Metallic Hill Nos. 1, 2, 3, 4 and 5, the Cache and the Confidence lode claims, Dugway district.

WASHINGTON COUNTY.

A landslide breaking a section of the ditch has delayed starting up the smelter of the Utah & Eastern C. M. Co. on Dixie ores at St. George, says Manager J. E. Beveridge. This ditch conducts water to the smelter from the Clara river, 3 miles distant.

The Virgin River Oil & Exploration Co. is incorporated. The company has 9000 acres near Virgin City. A well will be sunk.

WASHINGTON.

OKANOGAN COUNTY.

An option on the Mountain View and Keep Cool claims at Bodie, on Toroda creek, has been given to Manager D. W. McKinley of a San Francisco company for \$5000. The lead is 9 feet wide and shows values of \$8 per ton in gold. A shaft has been sunk 50 feet on the Keep Cool. The claims adjoin the Golden Reward.

SNOHOMISH COUNTY.

The Good Hope mine, above Mineral City, near Index, was sold last week to F. Thompson and W. J. Walters for \$1500. There is a 5-foot ledge opened up carrying gold, silver and copper ore.

Superintendent Sutton says the framing of the mill and cyanide plant of the Independent mine, near Silverton, is nearly finished, and the machinery will be installed next month. He expects to have their entire plant in operation by June 1. Water power will be used and they will treat 300 tons of ore daily. The ore carries mispickel.

STEVENS COUNTY.

Men are at work on the Double Standard mine, 7 miles north of Northport, on the line of the Red Mountain Railroad. The Double Standard is owned by J. E. and G. A. Almstrom and H. W. Walker of Northport.

T. Greenway, general superintendent of the Columbia River Marble Co., near Bossburg, says he will put up a sawmill and make lumber to erect buildings for the men and for the installation of machinery, after which a channeler will be put in operation taking out marble for shipment, as there is a considerable area of marble stripped ready to be hocked out.

T. F. Hertzell, manager of the Hertzell-Jay Gould M. Co., near Chewelah, says on the Jay Gould a sinking pump has been installed and sinking will be resumed on the main shaft April 1st, going down

to 300 feet. Last month, at 112 feet from the main shaft, a shoot of ore was cut, showing shipping ore 2 feet wide, with 15 feet of concentrating ore. The galena runs 50 ounces silver, 20% lead, \$5 gold and some copper.

WYOMING.

CARBON COUNTY.

The Con. G. & Coal Co. has been organized at Grand Encampment, consolidating the El Rey in Purgatory gulch, near Encampment, the North Park (Colo.) gold fields, and a copper mine adjoining the Coldwater mine at Pearl. J. E. Hedding, W. S. Price, E. R. Miller and J. W. Van Valzah of Pennsylvania, S. R. Neel, E. S. Drury and W. C. Henry of Grand Encampment, Wyo., are the directors.

Gold-bearing rock is reported found 2½ miles southwest of Battle Lake. Twenty men are at work in the Doane Rambler copper mine at Battle Lake. There are 2325 feet of underground workings opened up. A body of copper ore has been opened in the Aetna mine on Beaver creek and shipments begun. The men employed at the Ferris-Haggerty mine have been placed on the same wage scale as prevails in Colorado, by which some get an increase and others a slight decrease. These latter, however, will work shorter hours.

A strike is reported made last week in the main tunnel of the Aetna mine on Beaver creek, near Riverside. The vein is 4 feet wide and 30 feet of it has been uncovered. Assays show 20% copper with some gold.

FOREIGN.

BRITISH COLUMBIA.

(Special Correspondence).—With lead now near the \$14 mark on the London market, and several agents of American smelting concerns exerting themselves to procure Kootenay ores, the producers should soon be receiving 2c. per pound for their product. This will permit the operation at a profit of every silver-lead property in the Slocan and East Kootenay, capable of producing ore in shipping quantities.

An important factor in the silver-lead industry of this Province is the demand for the zinc ores heretofore thrown on the waste dumps of the Slocan mines. Several shipments of zinc ore from Slocan mines have been made to the Lanyon smelter at Iola, Kas., during the winter, and several of the mines are now making special arrangements to care for this product, the Slocan Star installing a concentrating plant for that purpose.

A second gold brick weighing 150 ounces has been sent off by the Broken Hill M. & Development Co., and with the first brick weighing 84 ounces previously sent off, represents the result of the first run of the Wilcox mill for a period of a little over one month. The value of the hullion (produced in the neighborhood of \$3500, while the concentrates made will probably bring the total returns for the run to over \$5000.

Returns from the Ymir mine for January are just to hand. During the month 4200 tons of ore crushed, with sixty stamps running twenty-nine days, yielded 1711 ounces of bullion, gross estimated value, \$70,365. There were 265 tons of concentrates shipped to Nelson smelter, at a gross value of \$9020. The cyanide plant treated 2550 tons, gross estimated value, \$4125; total working expenses for the month, \$16,750.

Nelson, March 15.

The Blue Jay mine, in Skylark camp, Boundary, has been leased on a working bond for \$10,000.

The Green Mountain mine, near Rossland is closed down for the present, the diamond drill prospecting being finished.

The foreign coal shipments from Nanaimo of the Western Fuel Co. for February amounted to 6406 tons. There were shipped from Ladysmith 20,986 tons. The total output of the Extension mines for February was 45,000 tons.

The Erie Placer M. Co. was incorporated last week at Spokane, Wash. The company owns placer ground near Erie. A hydraulic plant will be installed. F. E. Goodall, C. E. McBroom, W. H. Cowles, M. P. McCoy, W. A. Nicholls, I. M. Cornthwaite and R. D. Miller are the incorporators.

At Quatsino Sound, on Vancouver Island, the main tramway and the two branch tramways on the Comstock group are completed. The Yreka Copper Co. have been hampered in the delays in the arrival of material. The wharf and ore bunkers are finished and men are at work installing a compressor plant. The first shipment of ore to the smelter was made by steamer last week.

Superintendent Toy, of the Golden Eagle mine, of Alberni, says operations were stopped last month owing to heavy

snow, but will resume on a larger scale when spring opens. Thirty men were at work. It is a gold quartz proposition. Manager Bailey, of the English-Canadian Co., says he will open up the W. W. W. mine, on Granite creek, near Alberni. The Con. Cariboo Hydraulic M. Co. has leased the dam at the outlet of Quesnelle lake, near Quesnelle, says Manager Hobson.

The Hematite group of iron mines on Iron creek, a tributary of Bull river, near Fort Steele, consists of twelve claims, through which three veins of hematite run. The veins are from 10 to 25 feet in width, with stringers running into the main veins. A recent analysis showed: Iron, 34%; sulphur, 15%; phosphorus, trace.

It is reported the St. Eugene mine, at Moyle, will resume operations by April 1, due to the rise in lead on the London market. J. Cronin, manager, says ore reserves are blocked out in its horizontal workings sufficient for a three years' supply for the mill (350,000 tons).

Rossland mines are employing a total of 868 men, as follows:

Le Roi.....	360
War Eagle & Center Star.....	299
Josie Mine.....	75
Kootenay.....	30
Velvet.....	50
Number 1 (Le Roi No. 2).....	21
White Bear.....	18
Silica Works, Green Mountain, O. K.....	15

To these, as wages for February, was paid last week an aggregate of \$66,100.

Three miles from Fort Steele J. Taen-hauser is developing a copper property under Superintendent Judd. A tunnel is being run to cut the vein at a depth of 200 feet.

J. A. Darragh, superintendent of the Wide West mine, near Lardeau, has closed down work for the present. The crosscut tunnel is in 511 feet and has not yet cut the main vein. At 218 feet from the portal it cut a 14-inch vein of galena, which gave values in gold, silver and lead. The next lead was cut at 300 feet and was 5½ feet wide, with galena and carbonates.

The White Bear mine (the Black Bear claim of the Le Roi group to the south) at Rossland will begin shipments this month of ore from the shoot opened up in the drift on the 900-foot level.

The Canadian Smelting Works at Trail propose to make some additions to their equipment. The experiments in the refining department are practically completed, having extended over a year, and plans are being made for a refining plant to produce ten tons of lead per day additional. Two electric generators will be put in. The electrolytic method of lead refining is the one in practice at the Trail smelter.

CANADA.

ALBERTA.

The Canadian-American Coal & Coke Co.'s mines at Frank are shipping 1000 tons of coal per day, says Superintendent J. J. Fleutot. The main entry of the mine, which is in 6600 feet, has obtained a depth on the coal vein of 1000 feet. The vein, which is nearly vertical, averages in width 15 feet of clean coal. Nearly 3000 tons of coal are broken daily, about two-thirds of which are left in the rooms to be drawn out at some future time. An electric plant is being installed.

NOVA SCOTIA.

It is reported a seam of anthracite coal has been found at Hunter's mountain, Victoria county. Several years ago coal from this locality was submitted for test at the Geological Survey Department, but the main seam could not be located. This find is 6 feet wide.

MEXICO.

CHIHUAHUA.

A strike has been made in the Veta Grande mine, in the Parral district, which was bought recently by the American S. & R. Co., for \$200,000. The production of the mine is now more than \$300,000 per month.

The Americano mine at Terrazas was sold last week to the Torreon Smelter Co. for \$100,000 gold, says F. Esher, general manager of the Torreon smelter, and work has begun.

Near Ojo Caliente, Burns & Daly, of Ahumada, have bonded, for \$45,000 gold, the Grito de Dolores, Independencia, Constitucion and Oriente mines. They carry gold, silver and lead.

DURANGO.

Over 6000 pertenencias were denounced in the State of Durango during the first three weeks of February. Of these 3400 were denounced by a single individual, J. McDonald, near Sardinias, district of El Oro, says the Chihuahua Enterprise.

SONORA.

W. C. Green denies the recently pub-

lished report that he has sold the Cananea copper mines to the Rockefeller interests, and also says that there are 1400 American miners in Cananea and 400 Mexican miners.

It is reported the Mimbres M. Co., J. C. Bagley superintendent, will build a smelter on its property near San Javier.

The Cerro Colorado copper mines on Cerro Colorado mountains are under option to G. Gruning, A. H. Horffer and company of Hermosillo. W. Kiddle is superintendent.

The Sunset Coal M. Co. has been operating the coal and coke mines at Barranca for four years, and holds of anthracite and natural coke have been opened up. Bins are being erected preparatory to shipping, to supply the local demand.

NEW ZEALAND.

At Waihi the increase in output is due to the returns of the Waihi Co. This company, owing to the conversion of their dry crushing plant to that of wet, shows in the year's output a large increase. For 1901 the amount of ore treated was 159,325 tons, which yielded £461,205 hullion. For 1902 179,587 tons were treated, from which hullion to the amount of £520,138 was produced, showing an increase of £58,933. They have not yet reached their highest stage of production, inasmuch as the old Waihi mill of ninety stamps has only been recently converted, and it is only since the commencement of this 1903 year that sixty of the ninety stamps have resumed crushing on the wet system. In a week or so the balance of the ninety stamps will drop, bringing the mill up to full crushing capacity of 330 stamps. The hullion yield for 1903 should be not less than £550,000.

SOUTH AFRICA.

RHODESIA.

The total gold output for the month of January amounts to 16 245 ounces—an increase of thirty-five ounces over the previous month. Monthly returns since 1901 have been as follows:

	1903.	1902.	1901.
Ounces.	Ounces.	Ounces.	Ounces.
January.....	16,245	15,955	10,787
February.....	13,214	12,237	12,237
March.....	16,891	14,289	14,289
April.....	17,559	14,998	14,998
May.....	19,698	14,469	14,469
June.....	15,842	14,863	14,863
July.....	15,226	15,651	15,651
August.....	15,747	14,734	14,734
September.....	15,164	13,958	13,958
October.....	16,849	14,503	14,503
November.....	15,913	16,487	16,487
December.....	16,210	15,174	15,174
Totals..	16,245	194,268	172,060

Total for 1898, 18 085 ounces; 1899, 65,303 ounces; 1900, 91,816 ounces.

TRANSVAAL.

In the Pretoria diamond fields, the Schuller diamond mine was the first discovered; but, owing to the hardness of the ground, it was found impossible to treat it successfully. Further prospecting resulted in finding another pipe to the east. The ground in the newly discovered pipe presented the characteristic features of the Kimberley pipes, the surface portion being yellow and yielding plentifully, although the stones were generally of a low grade.

SWEDEN.

The Slangeli copper fields, which extend on each side of the boundary between Norway and Sweden, have been sold to the American Copper Co. for \$1,000,000, says a dispatch from Osterund.

PERSONAL.

T. CLARK, of Placerville, Cal., is in San Francisco, Cal.

G. McM. ROSS, of Virginia City, Nev., is in San Francisco, Cal.

D. McREA is in Denver, Colo., from Thunder Mountain, Idaho.

E. G. STOEBER, of Denver, Colo., is in Mexico on mining business.

W. S. JONES is manager of the Cloud City mine, near Leadville, Colo.

G. H. LEWIS, of Butler, Nev., is in San Francisco, Cal., on mining business.

A. R. ENGLISH, of Blsbee, Ariz., has gone to New York on mining business.

T. DERBY, of New Almaden, Cal., is in San Francisco, Cal., on mining business.

S. HUBBARD, JR., of Prescott, Ariz., is in San Francisco, Cal., on mining business.

F. C. LEONARD has returned to Salt

Lake City, Utah, from a trip to Kansas City.

J. F. PARKES, superintendent of the Kennedy mine, Jackson, Cal., is in Arizona.

N. H. MELIOR is superintendent of the Chittenden copper mines, near Florence, Ariz.

J. W. NEILL, of the Tintic M. & D. Co., is in New York from Salt Lake City, Utah.

P. W. FLEMING is at Globe, Arizona, with J. B. Coplen, making mine examinations.

C. W. PAGE returned last week to Denver, Colo., from a trip East on mining business.

F. BETTLES, of Salt Lake City, Utah, is examining mining properties near Butler, Nev.

R. CULVERT, of Amador City, Cal., is assayer at the Harvard mine, near Jamestown, Cal.

A. L. McEWEN has resigned as superintendent of the California mine, near Sumpter, Or.

W. LEATHAM is superintendent of the Dugway M. Co., at Dugway, near Fish Springs, Utah.

E. M. BINFORD is superintendent of the Carls mine, Tintic district, near Eureka, Utah.

F. N. C. WHYTE, manager of a copper property at Anaconda, Mont., is in San Francisco, Cal.

F. F. THOMAS, manager of the Gwin mine, Calaveras county, Cal., is in San Francisco, Cal.

SUPERINTENDENT HAMPTON of the Onida mine, near Jackson, Cal., is in San Francisco, Cal.

J. F. MILLS has returned to San Francisco, Cal., from inspection of mines in southern Nevada.

E. ROGERS of Toronto, Canada, has resigned as managing director of the Crow's Nest Pass Coal Co.

W. E. DOWNS, of Sutter Creek, Cal., civil engineer for the Kennedy mine, is in San Francisco, Cal.

G. W. RASDELL, superintendent of the Rawhide mine, near Jamestown, Cal., is in San Francisco, Cal.

C. R. DOWNS, superintendent of the Bunker Hill mine, Amador City, Cal., is in San Francisco, Cal.

DAVID McCLURE, superintendent of the Gwin mine, Calaveras county, Cal., is in San Francisco, Cal.

A. M. CANNON, president of the Dugway M. Co., is at Fish Springs, Utah, from Salt Lake City, Utah.

L. A. GROSS, superintendent of the Centennial mine, near Drytown, Cal., is in San Francisco, Cal.

W. A. SHEARMAN, of Salt Lake City, Utah, has gone to the Pactolus group of mines near Butler, Nev.

R. C. KNOX has returned to Norris, Mont., from a trip to Salt Lake City, Utah, on mining business.

W. J. CHALMERS, of the Allis-Chalmers Co., returned on the 17th from San Francisco, Cal., to Chicago.

J. GOODRICH, resident manager of the Highland Chief mine, near Wardner, Idaho, is in St. Paul, Minn.

H. A. KELLER is superintendent of the Horseshoe M. Co., near Central City, S. D., vice R. W. Rodda, resigned.

E. C. VOORHIES, superintendent of the Lincoln mine, Sutter Creek, Cal., is a visitor in San Francisco, Cal.

C. R. TOWNSEND is superintendent of the California mine, near Sumpter, Or., vice A. L. McEwen, resigned.

ELWOOD MEAD, of the United States Geological Survey, is in San Francisco, Cal., from Washington, D. C.

W. C. GREENE of New York, president of the Greene Con. C. M. Co. of Sonora, Mex., is in San Francisco, Cal.

SUPERINTENDENT PATRICK of the Tonopah Syndicate G. M. Co., at Butler, Nev., is in San Francisco, Cal.

J. A. VEATCH, manager Darlen G. M. Co., U. S. of Colombia, S. A., is in San Francisco, Cal., on a business trip.

M. B. KERR, manager of the Jumper Gold Syndicate of California, Ltd., at Stent, Cal., is in San Francisco, Cal.

W. E. RENSHAW, of Idaho Springs, Colo., manager of the Gem Con. M. Co., is in Pittsburgh, Pa., on company business.

W. F. DETERT, superintendent of Zeila mine at Jackson, Cal., and president of

the Argonaut M. Co., is in San Francisco, Cal.

S. K. THORNTON, superintendent of the Shenandoah mine near Plymouth, Amador county, Cal., is in San Francisco, Cal.

J. KEMP VAN EE, superintendent of the Royal Con. mine at Hodson, Calaveras county, Cal., is in San Francisco, Cal.

W. R. THOMAS, superintendent of the Central Eureka mine, Sutter Creek, Cal., is in San Francisco, Cal., on mining business.

E. P. COWEN returned last week to Boise, Idaho, from a two months' trip on mining business to Missouri and Texas points.

R. G. BROWN, manager of the Standard Con. M. Co., has returned to San Francisco, Cal., from a trip to their mines at Bodie, Cal.

T. H. ELLIS, president of the Yellow Jacket M. Co. and manager of the Detroit-Alaska M. Co., near Juneau, Alaska, is at Juneau.

W. W. WORTHING, of Stockton, Cal., superintendent of the Rhetta mine, near Plymouth, Amador county, is in San Francisco, Cal.

C. C. DERBY, superintendent of the mines of the Mariposa Estate with headquarters at Mount Bullion, Cal., is in San Francisco, Cal.

W. DAVIDSON, of Salt Lake City, Utah, is manager of the Caribou group of mines at Ophir, Colo., and will make his headquarters there.

MANAGER REBER of the Gold King and Crown Point groups, near Mountain Home, Idaho, has returned from Salt Lake City, Utah.

A. B. RICH, of Denver, Colo., is assayer at the Silver Bell mine, at Ophir, Colo., vice A. C. Gates, resigned to accept a similar position with a company at Globe, Ariz.

MANAGING DIRECTOR A. F. HOLDEN of the United States M. Co. returned last week to Salt Lake City, Utah, from California, and left the following day for the East.

J. G. ENGLISH, part owner of the Amazon group of mines near Sumpter, Or., has returned to Danville, Ill., from examining mining properties in Oregon and Washington.

W. DEAN, F. CARPENTER, W. H. VINTON, C. O. ROBBINS and O. W. CASSADAY, directors of the Valley M. Co., are visiting the company's mine at Leadville, Colo.

D. EVANS returned last week to Salt Lake City, Utah, after a protracted absence in California, and will devote his attention to the properties of the Mountain Lake C. Co., near Brighton, Utah.

A. B. CAMPBELL and J. A. FITCH of Spokane, Wash., operating Idaho and Montana mining properties, are in San Francisco in connection with reported transfers of Kendall, Montana, property.

H. Z. OSBORNE of Los Angeles, Cal., recently made a mule-back trip through the southwestern part of the State of Chihuahua, Mexico, visiting the mining districts of Guadalupe y Calvo, Bohorame, and La Cumbre, and returning by Parral.

F. L. SIZER of Helena, Montana, has been retained as consulting mining engineer by the Kimberly-Montana G. M. Co., which has taken over the Bear Gulch mines, near Jardine, Montana. The new company is preparing to operate on an extensive scale.

Commercial Paragraphs.

THE Main Belting Co. has opened its New York office in the Mutual Reserve building, 309 Broadway, room 913, for the prompt dispatch of business.

THE Jeanesville Iron Works Co., through the Denver Branch, reports as having shipped a large triple expansion pump, capacity 2100 gallons per minute, to the El Paso Con. gold mine, Cripple Creek. It required three cars to haul it. This pump is fitted with Corliss steam valves.

In connection with some recent changes in the Union Iron Works of San Francisco, Cal., the by-laws have been revised in accordance with the Eastern ideas, the finance committee having been made the ruling body. This committee is composed of Messrs. Max Pam, chairman, Lewis Nixon and H. T. Scott. The office of chairman of the board has been instituted. This chairman of the board is the chief

executive officer of the company, and as such presides over all meetings of directors and stockholders. Mr. Henry T. Scott was elected chairman of the board. The operating department is placed under the charge of the president of the company. Mr. W. G. Dodd has been elected president. The vice-president is named to act in the event of the inability of the president to do so. This office has not been filled as yet, but will be very shortly by Mr. Frank Jeffery, who will be in personal charge of the ship yard. Mr. Charles N. Champion is elected to fill the offices of secretary and treasurer, and Mr. L. J. Hart to fill the offices of assistant secretary and auditor.

Obituary.

ELIAS WELLER, a pioneer of El Dorado county, Cal., died at Sacramento, Cal., March 8, aged 75 years.

ADRIAN J. MERLE, a California pioneer, and for over a generation a prominent business man of San Francisco, died at his residence in Alameda, Cal., on the 15th inst., aged 62 years. Deceased was a native of France. He was president of the A. Merle Co., and of the Globe Brass & Bell Foundry, and leaves an honored name.

New Patents.

DEWEY, STRONG & Co's SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MARCH 10, 1903.

- 723,444.—LIFT—C. A. Bouck, Los Angeles, Cal.
- 723,651.—TEMPORARY BINDER—W. J. Brown, Portland, Or.
- 723,488.—HEADER PLATFORM—Campbell & Schwartz, Grass Valley, Or.
- 723,490.—COMBINATION SUIT—Mary E. Cavanaugh, Alameda, Cal.
- 723,413.—COFFEE POT—T. C. De Hart, Oakland, Cal.
- 723,364.—ELEVATOR—W. L. Holman, S. F.
- 723,513.—BALING PRESS DOOR—A. Johnson, Lafayette, Cal.
- 723,530.—OIL BURNER—J. McDermott, West Berkeley, Cal.
- 723,374.—BRACKET SCALE—G. E. Miller, Arlington Place, Cal.
- 723,315.—COMB—C. Moeschel, Los Angeles, Cal.
- 723,619.—LOCK—B. Phelps, Seattle, Wash.
- 723,621.—LOCK—B. Phelps, Seattle, Wash.
- 723,611.—LOCK—B. Phelps, Seattle, Wash.
- 723,632.—LOCK—B. Phelps, Seattle, Wash.
- 723,623.—LOCK—B. Phelps, Seattle, Wash.
- 723,357.—CONVEYER BELT—H. D. Richards, Sutter Creek, Cal.
- 723,633.—NECKTIE—Samter & Pinner, S. F.
- 723,638.—EVAPORATING PAN—E. R. Shaw, Ontario, Cal.
- 723,463.—PUMP LIFTER—I. D. Stark, Red Bluff, Cal.
- 723,644.—ABDOMINAL SUPPORTER—Eva M. Temple, Portland, Or.
- 723,467.—PICTURE HANGING DEVICE—W. F. Towne, Oakland, Cal.
- 723,473.—RAILWAY TIE—W. A. Wetmore, S. F.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co's SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

PICTURE HANGING DEVICES—No. 723,467. March 10, 1903. W. F. Towne, Oakland, Cal. The object of this invention is to provide a device, first, by which a picture hook by itself may be securely held while being placed in position upon the molding; second, by which a picture may be hung upon a hook already on the molding or upon a fixed support, as a nail; third, by which a picture and hook may be hung at one and the same time, whether a double or single cord or wire is used. The device does away with the necessity of climbing upon a stepladder or the like in order to engage or disengage the suspending wire or cord.

COMBINATION SUITS—No. 723,490. March 10, 1903. Mary E. Cavanaugh, Alameda, Cal. This invention consists in forming a complete suit for a child, including waist, collar, vest and overalls, all in one piece, and in a novel construction and arrangement of the parts with relation to each other. The trousers portion has an upward extension; the waist consists of a single continuous piece extending around the body and forming a double thickness beneath said upward extension of the trousers, said waist permanently attached to the trousers with an inter or extension below the line of connection for the attachment of under drawers.

OIL BURNERS—No. 723,530. March 10, 1903. J. McDermott, West Berkeley, Cal. This invention relates to an apparatus for the combustion of hydrocarbon oils and its preparation therefor previous to reaching the burner tip. It consists of devices by which the oil is finely divided and mixed with a suitable quantity of steam or air and finally delivered from the burner tip in condition for combustion. The mixing chamber contains a tip at the burner tip at the front, a removable chamber located between the mixing chamber and the tip and having plates located therein, said plates being formed with transverse concave-convex grooves and convergent from the rear to the front.

RAILWAY TIES—No. 723,473. March 10, 1903. W. A. Wetmore, San Francisco, Cal. The object of this invention is to provide an improved cross

tile for railway use in which the major portion of the tie is made of comparatively indestructible material and the ends or supports upon which the tie rests are made of short sections of wood detachably fixed to the steel portion of the tie. It consists of a rolled plate having flanges forming channels above and below, the upper channels being convergent and narrower toward the top, wooden blocks adapted to fit and be locked in said channels to form rail supports, shoulders formed at the ends of the channels equalizing with the outer ends of the block and the tie being downwardly projecting flanges fitting upon each side of the wooden blocks, and means for securing said plates and railway rails upon the blocks.

DOOR CLOSING MEANS FOR BALING PRESSES—No. 722,513. March 10, 1903. A. Johnson, Lafayette, Cal. This invention relates particularly to a novel form of toggle lever mechanism for actuating the door of baling presses of that class in which the material is fed in through an opening in the side of the press box upon the follower; and its object is to simplify the construction and operation of such mechanism. A door is hinged at the lower edge of the press box, with vertical guide walls between which said door is movable; a bent lever has its ends fulcrumed in said sides, with links pivoted to said lever and to the door to form toggle joints; pinions upon the ends of said lever, gear wheels engaging the pinions, and connections between said gear wheels and sweep by which said toggles are actuated to close the door.

Latest Market Reports.

SAN FRANCISCO, March 20, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22½d (standard ounce, 925 fine); New York, bar silver, 48½c, refined (1000 fine); San Francisco, 48½c; Mexican dollars, 38 @ 39c San Francisco, 38c New York.

COPPER.—New York: Standard, \$14.00; Lake, 1 to 3 casks, \$14.50 @ 15.00; Electrolytic, 1 to 3 casks, \$14.75 @ 15.00; Casting, 1 to 3 casks, \$14.60 @ 15.00; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £66 6s 6d spot per ton.

There is no material change in the copper situation since last week, other than a firm market, and no indications of a falling off in price. New enterprises do not immediately give signs of the effect of a raise in price and most old producers are already working to their full capacity. If the price is maintained between 14 and 15 cents, the output will be materially increased within six months.

LEAD.—New York, \$4.67½; Salt Lake City, \$3.50; St. Louis, \$1.00; San Francisco \$1.60, carload lots, 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 6½c; pig, \$4.76. London: £13 12s 6d per long ton = 2.75c per lb.

SPELTER.—New York, \$5.50; St. Louis, \$4.60; London, £23 10s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$29.80 @ 30.10; San Francisco, ton lots, 32c; 500 lbs., 32½; 200 lbs., 32½c; less, 33c; bar tin, \$1.10, 35c @ 37½c. London, £136 12s 6d spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19.00; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots, London, £8 16s; San Francisco, local, \$45.00 @ 46c of 76½ lbs.; Denver, \$49.50, export, \$43.50.

BABBIT MENTAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99 6 pure ingots, 36c; No. 2, 90½, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 21c; San Francisco, Plumbers', 100-lb. lots, 17.65c.

NICKEL.—New York, 50 @ 60c @ 100; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3c @ 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHEMICALS.—Cyanide of potassium, 98%—99%, johhng, 26 @ 26c @ 100 lbs.; 24 @ 24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 24 @ 30c @ 100 lbs.; caustic soda, in drums, 3 @ 4c @ 100 lbs.; Cal. s. soda, hbls., \$1.25 @ 1.60 @ 100 lbs.; sks., \$1.06; chlorate of potash, 12 @ 13c; nitrate of potash, hbls., 8c; caustic potash, 10c in 40-lb tins; borax concentrated, 7 @ 8c @ 100 lbs.; roll sulphur, 4 @ 6c; powdered sulphur, 2 @ 3c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2½c; sulphide of iron, 9c @ 10c; copper sulphate, 5 @ 7c; chloride of lime, spot, \$3.00 @ 4.00; sulphuric acid, in carboys, 66 @ 6, 2½c @ 10c; nitric acid, in carboys, 8c @ 10c.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.36 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

AILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2*, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.60; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.66; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.66, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s. 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$6.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.60; Brymbo, \$7.60; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linsed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, hbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron hbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86 Gasoline, bulk, 21c; do., cs., 27½c; 63 Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50 @ 55c.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ¾c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ¾c per lb. above keg price. Dry Lead—in hbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb. powdered, 9 @ 12c; fused, 25 @ 30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ 5c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—(90% and over) ½ lb., \$1.26.

MOLYBDENUM.—25c. ½ gramme; 1000 grammes—2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.26.

SODIUM.—Metal, ½ lb., \$1.25.

MERCURY.—Bichloride, ½ lb., 90c.

PHOSPHORUS.—(American) ½ lb., \$1.00.

SILVER.—Chloride, ½ oz., 90c @ \$1.00; nitrate, 65c.

URANIUM.—Oxide, ½ lb., \$3.50.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

MEETING NOTICE.

A convention is hereby called to meet at the Palace Hotel, San Francisco, Cal., on Wednesday, March 25, 1903, at 10 o'clock A. M., for the purpose of organizing a California Mine Operators' Association.

All mine owners, operators or companies are invited to attend.

BY ORDER COMMITTEE.

INVENTORS, Take Notice
L. PETERSON, MODEL MAKER,

544A MISSION STREET, bet. First and Second Sts., SAN FRANCISCO. Experimental machinery and all kinds of models. Tin and brasswork. All communications strictly confidential.

SITUATIONS WANTED.

A PRACTICING PHYSICIAN AND SURGEON, in San Francisco, of excellent standing, desires a position as surgeon to a mine or mining company. Is a graduate of the University of California. Best of references given. Address Box 12, this office.

ASSAYER WITH OWN OUTFIT WILL GO anywhere. Best references. Box 14, this office.

ASSAYER WITH OUTFIT WISHES A POSITION as superintendent of a mine, millman, smelterman or tool sharpener; 14 years' practical experience. J. L. Wetmore, 401 12th St., Oakland.

ASSAYER, CHEMIST AND MILLMAN (concentrating and amalgamating), thoroughly up to date in each branch, desires position. Best of references furnished of a 20-years' experience. Address Box 125, care Mining and Scientific Press, 606 Mack Block, Denver, Colo.

COMPETENT BOOKKEEPER, TYPEWRITER and general office man desires position with mining or smelting company. Can furnish best of references. Address Box 25, Mining and Scientific Press office.

COMPETENT MILLMAN, MACHINIST AND Chemist, Experience free mill and concentrating. College education. Have built and operated mill in Montana for 12 years. Competent accountant and able to administer affairs of a company. Would like situation with a company out of a promoter's hands. Reference the best. Address H., care this office.

MILLMAN AND ASSAYER, SEVERAL YEARS' experience, wants a position; will go anywhere. Address F. D., this office.

MILLMAN, PRACTICAL, WITH 20 YEARS' experience, wants a situation. Concentration, amalgamation, cyaniding and assaying. Best of references. Arizona or New Mexico preferred. Address "Millman," 1056 South Gaylord Street, Denver, Colorado.

PRACTICAL MINER WITH TECHNICAL EDUCATION, understands prospecting, blowpiping, surveying, etc., desires position. Address J. E. H., care of this office.

STAMP MILL MAN, EIGHT YEARS' EXPERIENCE, wants position. Address Box 20, Mining and Scientific Press.

WANTED, SITUATION AS ASSAYER—MINE, mill or smelter, Mexico preferred. At liberty May let. Am also an engineer and draftsman. Can furnish best of references. Address E. C., this office.

WANTED, POSITION AS SUPERINTENDENT of mill. Have had six years' experience in cyaniding in all the details of the process, including designing, building and operating plants. Wet crushing in cyanide solutions and elms treatment a specialty. Can superintend mine if desired. Will go anywhere. Address "Milton," care of Mining and Scientific Press.

YOUNG MINING ENGINEER OF SOME PRACTICAL experience desires position as assistant. Good surveyor, assayer and draftsman. Best of references as to character and ability. Will go anywhere. Address E. D. C., care of this office.

YOUNG MINING ENGINEER DESIRES POSITION as assistant. Good draftsman, assayer and surveyor. All references. Address L. E. M., care Mining and Scientific Press.

Have 100 Acres Dredging Land That Will Bear a Thorough Investigation

None but intending purchasers need apply. Address Box 19, this office.

I will give one-half interest in two mining claims or one-half interest in ten claims for \$100 each, to do assessment work in this great camp.

Address JOHN HOWSAM, Tonopah, Nevada.

RAILROAD SURVEYS. Applications for portions of Transients and Topographers will be received by the undersigned up to April 1st. None but experienced men need apply. The Company furnishes its own instruments and equipment. Address Chief Engineer O'gon and Pacific R. R., Room 29, 2nd floor, Mills Building, San Francisco.

THE CALIFORNIA DEBRIS COMMISSION, having received application to mine by hydraulic process from J. L. Miller, in North Eureka Placer Mine, near Railroad Flat, Calaveras County, Cal., draining into Spruce Gulch Creek, which reaches South Fork of Mokelumne River, and from John C. Jens, in Gold Hill Consolidated Placer Mine, near Esperanza, Calaveras County, Cal., draining into Calaveras and Esperanza Creek, which reaches Calaveras River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., April 6, 1903, at 1:30 P. M.

THE CALIFORNIA DEBRIS COMMISSION having received application to mine by hydraulic process from Calaveras Development Co., in Aurelia Gravel Mine, near Railroad Flat, Calaveras County, Cal., draining into Independence Creek which reaches South Fork of Mokelumne River, gives notice that a meeting will be held at Room 96, Flood Building, San Francisco, Cal., March 23, 1903, at 1:30 P. M.

Imperial Cable Coating.

For Hoisting, and all Wire Cables. PRESERVES. Over 1000 barrels sold by us in California, proving te superiority. Barrels 40c., cases 50c. per gallon.

GEO. PARTRIDGE & CO.,
123 California Street, San Francisco, Cal.

WANTED.

Wanted, to interest capital in a valuable placer claim suitable for DREDGING ONLY.
Address "Placer," care of this paper.

An Experienced Chemist and Assayer wishes to purchase a working interest in an established assaying and analytical office which is capable of extension and well located. Address A., Mining and Scientific Press, San Francisco.

Wanted---A Superintendent

For foundry, forge, machine and boiler shops employing 200 men. Should be posted on mining machinery, structural work and up-to-date methods. Permanent position in excellent location. State qualifications and experience fully and salary expected. Answers confidential. Address Z., P. O. box 158, Station C, Los Angeles, Cal.

CAPITAL REQUIRED.

The owner of a mining claim, situated in one of the leading districts of California, at present being developed, is desirous of disposing of a one-half interest, the amount received to be expended upon the property. This is a legitimate and promising enterprise. For further particulars address Box 21, this office.

WANTED

STAKE TO PROSPECT A GOOD SECTION OF Montana. Am well acquainted with the State and technically educated. Address Prospector, care this office.

WANTED TO BUY.

A Good Second-Hand Mill or Concentrator of 25 to 40 Stamps, Steam or Water Power.

Must be cheap and machinery in good working order and situated so it can be dismantled and loaded on cars without great expense. Address "Stamp Mill," care Mining and Scientific Press.

WANTED.—PROSPECTORS AND LEASERS on private estate in California, 20,400 acres. Timber and water plentiful. The "GREAT STONEWALL" mine which has produced two million dollars of profit, which has never been prospected. For particulars, address

S. H. LUCAS,
CUYAMACA, CAL.

DELINQUENT SALE NOTICE.

WEIR FILTER COMPANY.—Location of principal place of business, San Francisco, California. NOTICE.—There are delinquent upon the following described stock, on account of assessment (No. 1) levied on the 26th day of January, 1903, the several amounts set opposite the names of the respective shareholders, as follows:

	No. Cert.	No. Shares.	Amt.
H. L. Cope, Trustee.....	22	16,000	\$18 76
H. L. Cope, Trustee.....	23	16,000	18 76
H. L. Cope, Trustee.....	24	16,000	18 76
H. L. Cope, Trustee.....	26	24,000	80 00
H. L. Cope, Trustee.....	37	24,000	80 00
H. L. Cope, Trustee.....	38	24,000	80 00
H. L. Cope.....	6	2,990	8 74
B. A. Laws, Trustee.....	41	8,760	4 69
B. A. Laws, Trustee.....	43	8,760	4 69
William Weir.....	13	10	02
William Weir.....	14	140	18
William Weir, Trustee.....	30	7,850	9 19
F. M. Cartan, Trustee.....	61	3,750	4 69
Samuel Wheeland, Trustee.....	17	8,760	4 69
William S. Sage, Trustee.....	60	8,760	4 69
J. V. Lavery.....	53	10	02
J. B. Nevin, Trustee.....	34	150	19
F. M. Cartan, Trustee.....	48	7,600	9 38

And in accordance with law, and an order from the Board of Directors, made on the 26th day of January, 1903, so many shares of each parcel of such stock as may be necessary will be sold at public auction at the office of the company, 312 Sacramento street, San Francisco, California, on MONDAY, the 23d day of March, 1903, at the hour of 12 o'clock M. of said day, to pay said delinquent assessments thereon, together with costs of advertising and expenses of sale.

E. McALLISTER, Secretary.
Office—312 Sacramento Street, San Francisco, California.

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MINING AND SCIENTIFIC PRESS

Whole No. 2227.—VOLUME LXXXVI. Number 13. SAN FRANCISCO, CAL., SATURDAY, MARCH 28, 1903.

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The Patio Process.

Although introduced in 1557 in Mexico, but little improvement has been made on the patio process, which seems to be particularly adapted to the treatment of the silver-gold ores of that Republic. A description of the chemistry of the process will be found in the MINING AND SCIENTIFIC PRESS of Dec. 27, 1902, and Jan. 3, 1903.

In the operation of the patio process the ore as it comes from the mine is broken into small pieces with hand hammers by men, women and children, who select or sort the ore, at which they become very expert. The high-grade or first-class ore is sent to smelters, the waste is neglected and that of medium value, the middlings, is sent to the hacienda for treatment. Here it is crushed in a rude stamp mill, often furnished with iron-shod wooden shoes having heavy stone dies. The stamp mill reduces the ore to coarse grains, and it is then ground to powder in either a Chilian mill or an arrastra, the latter being preferred in Mexico. This grinds the ore between heavy stones, which are dragged around the arrastra basin suspended from horizontal arms projecting from an upright central shaft. Mules are attached to the ends of arms which extend beyond the limits of the arrastra basin, about which they are driven in a circle. When the ore has been ground into pulp it is slimy and mixed with a large amount of water. It is run or dipped out of the arrastra into a broad, shallow pit, where the heat of the sun evaporates the water until it has reached the consistency of thick mud. It is then ready for the patio or yard.

This is a broad surface of ground prepared for the operations which take place there. It usually has a gentle slope, which allows superfluous water to run off. In this space are one or more circular plats, surrounded by a low rim of wooden blocks or stones. Within these shallow basins is the pulped ore, looking like mud and colored red, yellow, black or gray, depending on the character of the ore. According to the size of the basins, they contain from 20 or 30 to over 100 tons. When first introduced the pulp, or "torta," as it is called by the Mexicans, still contains a large percentage of moisture, which is still further evaporated. When the proper consistency has been reached, in the opinion of the major domo,

or overseer, salt is added in quantity suited to the ore, and mules or horses are driven into the basin and these are made to walk about and thoroughly mix the charge. A period of rest follows, lasting one or more days, when sulphate of copper and iron, obtained by roasting chalcopryite in reverberatory furnaces, is added. This sulphate is called "magistral," and is said to be superior to pure copper sulphate, though why this is the case has never been explained. Additional salt is introduced to the charge, as required. The addition and amount of all chemicals—salt, "magistral" and mercury—are all varied as to amount and time of introduction by the

value and character of the ore. It requires from two to six weeks to properly treat a charge of ore in the patio, the time being partly dependent upon the season of the year, as much of the success of the process depends upon the sun's heat. During the greater part of the time the horses or mules are driven about the bed of ore. The accompanying engravings illustrate characteristic scenes in the patio and a stamp mill.

The overseer makes occasional tests to determine when amalgamation is complete, and when this is considered satisfactory the animals are driven out of the pit, water is introduced to thin the pulp and the charge run off, leaving the amalgam behind on the floor of the basin, where it is collected, and the basin is ready for another charge of ore. Although a simple and somewhat primitive process, it saves a high percentage of the precious metals, and in a country where labor is cheap and time not an essential factor it is superior to pan amalgamation, both in point of economy and in results.

The illustration of the two-stamp mill is characteristic of some parts of Mexico, particularly in the region remote from railroads. This mill is near Guadalupe y Calvo, in the State of Chihuahua. This place was at one time the site of a government mint. The veins are fissures in andesites. Some of the veins are true quartz veins and others are simply crushed and mineralized zones of andesite. The principal mines of the district are the Rosario and the Independencia. The Rosario is one of the largest producing quartz veins in the world, being from 60 to 150 feet wide, with a bold outcrop visible from a great distance. There is an open cut on this vein 1800 feet long, 130 feet wide and several feet in depth. The Rosario vein is reported to have produced, from 1838 to 1847, \$40,000,000.



Two Stamp Mill (Wooden Stamps), Guadalupe y Calvo, Mexico.



The Patio Process in Mexico.

MINING AND SCIENTIFIC PRESS.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Two Stamp Mill (Wooden Stamps), Guadalupe y Calvo, Mex.	193
The Patio Process in Mexico.....	193
Graphic Method of Mapping Exposed Ore Bodies.....	196
Hoisting Engines at No. 5 Shaft, Tamarack Mine, Michigan.....	199
Mechanical Oil Pump.....	200
Rolling Toggle Crusher.....	201
Mining and Metallurgical Patents.....	202
EDITORIAL:	
The Patio Process.....	193
Electro-Magnetic Separation.....	194
Mine Bell Signals.....	194
Modern Engineering Practices.....	194
Silver Bullion for the Philippines.....	194
Tin Mining in the United States.....	194
Employers' Organizations.....	194
Asking for a Rehearing of the Case.....	194
MINING SUMMARY.....	203-204-205-206-207
LATEST MARKET REPORTS.....	208
MISCELLANEOUS:	
Concentrates.....	195
Graphic Method of Mapping Exposed Ore Bodies.....	196-197-198
Electrolytic Treatment of Arsenical Ores.....	198
Bear Gulch Tin District, South Dakota.....	199
Copper Mining in Upper Michigan.....	199
German Copper Consumption.....	199
Witwatersrand Gold Fields.....	200
Lunkenheimer Mechanical Oil Pump.....	200
The Bingham District, Utah.....	200
Rolling Toggle Crusher.....	201
Steam Turbines.....	201
Metallic Manganese.....	201
Manufacture of Portland Cement in California.....	201
Mining and Metallurgical Patents.....	202
Personal.....	207
Commercial Paragraphs.....	207
Obituary.....	207
New Patents.....	207
Books Received.....	207
Notices of Recent Patents.....	207

Electro-Magnetic Separation.

For years the low-grade sulphide ores of Leadville, Colo., and particularly those containing complex sulphides, as most of them do, having lead, zinc, iron and copper as well as gold, silver and other minerals in their makeup, have been an economic problem of absorbing importance to the mine owners and operators of that district. The most refractory ores are those combining large amounts of zinc sulphide with those of lead, iron and copper. There are reduction works where the lead and iron sulphides can be disposed of to advantage, but the lead smelters generally impose a penalty on zinc in excess of a stated percentage. Until recently there was no satisfactory method of separating the zinc from the accompanying sulphides, but the electro-magnetic separation of these minerals, which has only recently been accomplished, has apparently solved this vexed problem and has given a new impetus to mining in the "carbonate camp."

The Resurrection Company of Leadville has built an experimental plant for the separation of zinc sulphide from galena and pyrite; it is stated to be in successful operation, and the mill will be enlarged. A similar separating device has been introduced in British Columbia, it is stated, successfully, and valueless dumps of low-grade zinc-lead-copper and iron ore have suddenly assumed an importance and a value not previously available. In almost every lead-silver district in the world zinc appears sooner or later in depth and with it usually lower values in precious metals, and heretofore this combination of base sulphides has often resulted in suspension of mining and metallurgical operations, for the reason that the lead smelter did not want the zinc, and the zinc smelter did not want the lead or iron, and the copper smelter wanted neither zinc nor lead. As the new electro-magnetic separators are said to make a clean product of the zinc, leaving barely a trace with the lead, iron and copper, it may easily be understood how valuable an acquisition this new method of separation is to the industry of mining in those districts where these complex sulphide ores occur.

Mine Bell Signals.

The South Dakota Legislature has passed a law fixing a code of mine bell signals for use in all the mines of that State. It is always advisable to have strict uniformity in mine bell signals, as the likelihood to accident or misunderstanding between the miner underground and the engineer on the surface is greatly reduced thereby, but the code adopted in South Dakota is subject to some criticism. The code as published in the Black Hills Mining Review is as follows:

One bell, hoist; one bell, stop (if in motion).
Two bells, lower men; three bells, hoist men.
Four bells, blasting signal. Engineer must answer by raising bucket or cage a few feet and letting it back slowly; then one bell, hoist men away from blast.
Five bells, steam on; six bells, steam off.
Seven bells, air on; eight bells, air off.
Three two-two bells, send down tools.
Nine bells, danger signal (fire, accident or other danger). Then ring number of station where danger exists.
No person shall ring any signal bell except the station tender, unless in case of danger or when the main shaft is being sunk.

Engineers must slow up in passing stations when men are on the cage or bucket.

Here a lengthy combination of numbers is inserted indicating the several levels from the first to the twentieth.

If a cage is wanted, ring station. Station tender will respond in person.

If station is full of ore and station tender is wanted, ring station signal.

One copy of this code shall be posted on the gallows-frame and one before the engineer.

The first signal (one bell to hoist, or stop, if in motion) is in common use almost everywhere, and cannot be improved upon, but the signals "two bells" lower men and "three bells" hoist men are defective as giving no premonitory warning, and make no distinction, so far as indicated by the published code, between men and materials. A better signal for lowering men is 3-2. This indicates that there are men to be lowered, whether it be from the surface or from some level to a level below it. If men wish to descend to any particular level, that level should be rung first, then 3-2. A hoisting signal for men which has had years of trial is 3-1, or, hoisting with men from a level to any one above, the level first, then 3-1.

The clause requiring the engineer to slow up upon approaching each level seems superfluous and is prohibitory to rapid winding where large tonnage is hoisted daily through a single shaft, and would be unnecessary in a well-constructed shaft where there is competent and experienced management. The provision that the signal code shall be posted in the engine room and on the gallows-frame at the collar of the shaft should include the station at each level of the mine. It seems unfortunate that the signal code is not uniform throughout the United States, as then miners, who are migratory, would be familiar with it, no matter in what district they might be employed.

In this connection it is interesting to note that the necessity for a uniform code of mine bell signals has been recognized by the Legislature of Montana, which adopted a resolution suggesting a conference of the Governors of the several mining States, with a view to establishing a uniform signal code for mines throughout the United States.

IN these days of modern, careful, painstaking engineering practice, there is no excuse for building a quartz mill not well adapted to the treatment of ore to be handled in it, when it has been determined what process is best adapted to the ore; still it is not an uncommon thing to see men shoveling ore into a breaker sitting a foot or more above the ore floor; grizzlies so arranged as to feed to the end of the mill; illy constructed battery frames; belts running in the wrong direction; retaining walls to hold loose rock when bedrock foundations were as easily and less expensively obtainable. These and other mistakes of construction and unfortunate selection of site, where better could be had, are of common occurrence.

THE Treasury Department, Washington, D. C., has given notice that it will buy \$2,000,000 worth of silver bullion, to be coined into 5,000,000 pesos, for use in the Philippine Islands. This bullion will be bought at market rates.

Tin Mining in the United States.

Tin production in the United States has never assumed importance, though several efforts have been made to develop tin mines in widely separated regions. In 1885-86 development of the tin prospects in the Harney Peak region of South Dakota was active and a large mill was built at the Etta mine, near Harney City, and subsequently a great amount of money was expended in the acquisition and development of tin prospects in the region about Hill City, a few miles from the Etta mine. After an active existence lasting two or three years these mines were closed, since which time little has been done attracting the attention of the outside world. In 1890-91 an English corporation known as the San Jacinto Estate expended a large sum in the erection of buildings, reduction works, roads and water privileges in Riverside county, Cal., and sank two shafts, each about 300 feet in depth, connected by a level. The total outlay for labor and improvements is stated to have largely exceeded \$500,000. About twenty tons of tin was produced and sold, and the metal was reported to be of superior quality. Operations ceased at this place and no important development in tin has since been reported in the United States, until the announcement of the discovery of cassiterite in the Santa Ana mountains, in Orange county, Cal., where considerable development has since been done on the tin-bearing veins. This district is only a few miles distant from the property of the San Jacinto Estate. In the Black Hills of South Dakota a new company has been recently organized to develop tin prospects in the Bear Gulch region, where tin is known to occur in veins.

The fact that no tin has ever been produced in the United States at a profit does not argue that tin veins may not be developed which will yield a profit. The tin mining industry requires the same experience, technical knowledge and skill that any other branch of mining requires, if not more than some others, and the fact that the industry is new in this country and not as well understood as elsewhere may in a measure account for the repeated failures in establishing a permanent industry.

Employers' Organizations.

As a natural result of the repeated demands made by organized labor throughout the country, not only in mines and metallurgical establishments, but in commercial and manufacturing industries as well, employers are organizing for defensive action, legislation and protection in any form that may be demanded by the situation. The structural iron manufacturers have recently organized for this purpose. This organization will be known as the Structural Iron Manufacturers' Association. This step has been taken in view of the report that the iron workers intend to make an organized demand on May 1 for an increase of wages. The newly formed California Mine Operators' Association was organized for a similar purpose. The latter organization passed a resolution at its meeting held in San Francisco, Cal., March 25, to the effect that the members of the Association, in the employment of workmen, would not discriminate against non-union men. The association of employers will undoubtedly have the effect of either deterring workmen from making unjust demands, or aggravate them into making increased demands by reason of opposition. With organization of both employers and employees, arbitration seems the only rational solution of labor difficulties which may occur hereafter.

In line with this idea Gov. Peabody of Colorado appointed an advisory board to consider the causes which have led up to the strike in Cripple Creek, Colorado City and elsewhere in the State, hearing both sides of the controversy. At a meeting of the board held at Colorado Springs, officials of the Western Federation of Miners stated that the chief cause for the strike against the mills at Colorado City was the discharge of men because they were members of the union.

IN the case of the Argonaut Mining Co. vs. the Kennedy Mining Co. of California, which was recently decided by the United States Supreme Court in favor of the Argonaut Co., the Kennedy Co. have filed a petition asking for a rehearing of the case.

CONCENTRATES.

IN litres—metric system—a British gallon (277.274 cubic inches) would equal 4.543 litres; an American gallon (231 cubic inches), 3.785 litres.

WITH the barometer standing at 22.8 inches the atmospheric pressure per square inch would be 11.19 pounds, indicating an altitude above sea level of 7610 feet.

A 10-INCH sheet iron pipe .12 inch thick would weigh sixteen pounds to the lineal foot, and at a velocity of 10 feet per second would discharge 308 cubic feet water per minute.

ALL tunnels, drifts and crosscuts should have good grade, and a clear ditch either at the side or underneath the track for drainage. There is no economy in having a wet, sloppy level.

IT IS rarely that a millman is justified in using a steel chisel on amalgamated plates, though it is sometimes done where the amalgam is abundant and hard, leaving a good coating still on the plate.

A CANADIAN PATENT is good for eighteen years, but the patent must be used or worked or put in practical use within three years from the date of issue. The time may, however, be extended for cause shown.

THE proper place for a belt shifter is on the slack side and near to the driven pulley. The shifter should be provided with two rollers, twice the length of the width of belt, and set on an angle of 75° with the center line of the belt.

BARIUM ALUMINATE in solution of a density 4° or 5° Baume is useful as a preventive of boiler scale. The barium aluminate combines with the sulphate of lime and carbonate of lime, forming neutral and insoluble barium carbonate.

ANTHRACITE COAL does not occur abundantly, as far as known, outside of Pennsylvania. Its occurrence is reported in Rhode Island, near Providence; at Crested Butte, Colo.; at Cerrillos, New Mexico; in Washington, and near Banff, B. C.

JASPER sometimes contains gold or silver when in a mineral zone or vein. It is usually the result of the metamorphism of shales or slates, or is the result of a segregation of silica in limestone. In the latter case the rock is known as chert.

A CEMENT FLOOR is advisable in a quartz mill beneath and about the plates. A floor of this description is easily kept clean, and all escaping quicksilver and amalgam may be recovered by washing into a small basin or launder to which the floor drains.

IN mining or merchandising or any corporate enterprise overcapitalization does not mean large capitalization, but means the imposition upon an undertaking of a liability without a corresponding asset. It is thus a fraud upon those who contribute the real capital.

A 20% GRADE would be a rise or fall of 20 feet in every 100 feet—not on the slope, but measured horizontally; in this way a 100% grade would correspond to an inclination of 45°. A rise or fall of 1 foot vertically in 20 feet, measured horizontally, would be a 5% grade.

DARK STRAW COLOR is a proper shade for the temper of drills in hard rock and blue for picks. Tempering of mine steel requires experience and judgment on the part of the blacksmith. Too high a heat in the forge will "burn" the steel and render it unfit for use, as it cannot be easily retempered.

WHERE the opening is 16 inches long and 4 inches high, and the head of water is 4 feet: $16 \times 4 \times 4.18 = 267.52$ —the number of cubic feet of water passing through the opening per minute. With the same head of water there would be discharged from an orifice 1 inch square 4.18 cubic feet per minute.

MINE SWITCHES underground should be well constructed and fitted in such a manner that the trammee need not be required to stop or slow up unless it be necessary to turn the switch. Switches so poorly made that cars are frequently derailed in passing are more expensive than one of much greater original cost.

A PROSPECTOR is not permitted to enter a millsite for the purpose of prospecting, but a vein found outside the millsite and extending through it may be located to take in the millsite. In the event of an adverse the character of the land in question must be determined by the Land Department and not by the courts.

THE recording of mining locations is not required by the United States statutes, but, where State or local district laws make recording a requirement in location, it is imperative. A claim which superficially shows indications of value sufficient to justify even preliminary development, is worth recording, whether the mine be in an

organized district or not. Too much care cannot be taken in securing a perfect title to the claim before its value is proven, as later when values are developed there is danger of trouble, which increases with the value of the mine.

THERE are two meanings to the term horse power in engineering. One, a unit or measure of rate of work, or work done in a specified time by any source of energy as a waterfall, steam boiler, a current of air, or water, by a prime mover as a water wheel, a steam engine, or wind-mill. This unit is 33,000 foot-pounds per minute.

PSILOMELANE is an ore of manganese. It has a hardness of 5 to 6 and a gravity of 3.7 to 4.7. It is brownish black in powder, but is iron black to dark steel gray in mass. The composition is doubtful, having a considerable range, generally impure from admixture of silica and other substances. Occurs with pyrolusite (the black oxide).

THE average percentage of copper in the ore mined in the United States would be difficult of determination, ranging from less than 2% in some of the Lake Superior mines to 60% and more in small lots of oxidized ore. The average grade of the ore mined at most of the large sulphide mines of Montana and Arizona is from 7% to 10%, though some mines are lower in grade.

AURIFEROUS CONGLOMERATES may be the result of wave action on a shore line, where the material composing the conglomerate was originally gold-bearing, or it may result from the consolidation of river gravels containing gold. The cementing material may be silica, clay, carbonate of lime, iron or the fine detritus derived from the disintegration of the original material.

AN acid is a compound of hydrogen, or hydroxyl, with a non-metallic element (as chlorine, sulphur, nitrogen, phosphorus, etc.), or a radical containing these elements. The hydrogen may be replaced in them by metallic atoms, the result being then the formation of a salt. As an example of the latter may be taken calcium hydrate and sulphuric acid, which gives calcium sulphate and water.

METEORITES—real meteorites—are valuable. Specimens from some localities will bring a higher price per ounce than gold ore. The genuine meteorite can be told by placing nitric acid on the polished surface of the specimen; if the peculiar etched surface appears, it is the real meteorite, and some museum or collection wants it. Specimens that come from unusual localities are more valuable than those found in known fields.

THE rarest of all specimens in mineral collections is platinum in nuggets of any size. Most public collections exhibit platinum in flattened grains, but seldom in anything beyond a few-grain nugget. Most of the museums show models of large Russian platinum nuggets. The largest nugget of platinum ever discovered is said to have been found in a Russian platinum mine, it weighing 21 pounds troy. Nuggets weighing up into the pounds rarely find their way to mineral collectors in this country.

FINE GOLD may be saved in sluice boxes by employing what is known as quarter-sawed cedar boards, which should be placed in the bottom of the sluice the same as a slat rifle. The coarse material is cut out by use of grizzlies. The fine gold catches in the rough surface of the cedar boards, which are placed with the rough edge against the current. They may be quickly removed from the sluices and the gold recovered by inverting the board and pouring over it a stream of water.

NO. 1 NITRO POWDER contains 70% nitro-glycerine, No. 2 contains 40%. No. 1 is advised in hard, tough rock, and much less powder of the higher grade will frequently accomplish more satisfactory results than No. 2, as it is often necessary in hard rock to place so much of the No. 2 in a hole that the collar of the hole only is blown off, leaving two, three or more feet of the drill hole, which must be shot repeatedly until the ground is broken. No. 1 having much greater force, exerts it near the bottom of the hole, and usually accomplishes the desired result.

THE charges for milling ores in stamp mills vary greatly, depending on the character of the ore, and sometimes on competition. It may vary from \$2 to \$20 per ton, but \$2.50 per ton is the usual price for free-milling ores, special arrangements being usually made for large quantities. It is difficult to establish what percentage shall be guaranteed, as this may differ with the character of the ore, but with ore not too difficult of treatment in a mill thoroughly equipped with modern concentrating devices 85% to 90% should be expected. If the mine owner has a large amount of ore to treat it is sometimes more satisfactory to lease the mill and employ all the necessary hands.

BARITE (heavy spar) is found crystallized in but small quantities in the United States. Few specimens have been produced that will compare with the fine productions of the Cumberland, England, mines. A few years ago some prospectors in sinking a shaft for lead and zinc near Galena, Kansas, ran across a pocket of well-formed crystallized barites of bluish and white color. Not knowing the value of the find, the miners tossed the spec-

imens on the dump along with rock and dirt. A few were kept from curiosity and one, owned in Chicago, shows the blue barite crystals in slab form protruding from gangue, and, though less transparent than English specimens, yet is remarkable because of the locality from which it was taken. No other known find of crystallized barite has been made in the Joplin, Mo., district, though it occurs massive in some places there.

WHEN the quicksilver added to amalgam is poured off from the amalgam and the latter squeezed through a cloth or buckskin, there always remains some fine gold in the mercury which passes the cloth. This may be recovered to a great extent by pouring it into a 2-inch pipe about 12 inches in length, provided with a cap at the lower end, and having a small hole bored about 2 inches above the bottom. This hole should be plugged. After standing several hours the gold in the quicksilver settles to the bottom, when by removing the plug from the hole in the side of the pipe the mercury above it will run out, leaving the amalgam in the bottom of the tube, which may then be retorted without loss. Of course this is unnecessary when the quicksilver is kept in constant circulation in the mill, but is useful in final cleanup, or when it is desired to clean the quicksilver.

WHERE a person locates a claim and fails to perform the assessment work thereon as required by law, but only goes upon the claim and works a few hours, it has been decided by the California Supreme Court that "a party cannot hold a mining claim for several years without doing in any year the work required, by simply going in at the beginning of each year and doing a few hours' work, with no bona fide intent to comply with the statutory requirements as to the amount of work to be done. It is against the policy of the law, and a fraud against the Government and the law, to hold quartz claims by merely doing a few dollars' worth of work thereon at or near the beginning of the year next following the year on which the claimant failed to do the necessary work. Such labor is a pretense and a sham, and will not prevent the relocation of the claim for want of necessary work."

THE number of feet a machine drill can cut in competent hands in a shift of eight hours depends upon the character of the rock. In medium hard rock 45 to 60 feet is a good shift's work. This may be more or less, according to the condition of the ground as to fractures, slips, etc. A badly fissured ground gives more trouble than a massive, homogeneous rock. The pressure of air at the drill is also an important factor. Not less than ninety pounds per square inch should be employed on hard rock. The drills do not last as long, but they do far more work than at lower pressures. There is much difference of opinion as to the relative merit of machine drills and hand drills in shaft sinking. It is generally conceded, however, that machine drills usually make better headway, but at increased expense. By either method a premium system of payment accomplishes the most satisfactory results.

IT would often pay a mining company to give its foreman or superintendent a three months' leave of absence under full pay, and all travelling expenses audited, and let him wander around a little. It sometimes happens that when a mine foreman or superintendent stays a long time in one place without the educational advantages of travel that he gets to fancying he knows it all, and the particular hole he is in is so exactly the center of the universe that the horizon comes down equally on all sides of it, and that when he dies wisdom dies with him. When one gets that way he is about fat enough to kill. Everybody is wiser than anybody, and no matter how experienced or wise or clever one may be he can learn something by a visit to the next mine, or county or State. If he has set in one little groove for ten or fifteen years he cannot realize how narrow he is or how far behind his broader minded fellows who travel around. It would pay him and pay his employers to take a tour of observation, for every real progressive miner will die learning, and when one ceases to learn he is dead, even if he doesn't know it.

THE relative merit of belt concentrators and shaking tables must be determined by experiment on the ore to be treated. The mistake is usually made with both types of these machines in the endeavor to concentrate both coarse and fine sulphides on one machine. This is physically impossible, as the size of particles of sulphide mineral will vary from the coarsest that will pass the screen, say 30 or 40 mesh, to those that will readily pass a 200-mesh. It is not reasonable to expect any sort of concentrating machine having a uniform grade, given amount of water, and traveling at a stated speed with the same number of vibrations, to make a clean separation of these extremes in sulphide particles from any sort of gangue. Hydraulic sizers, or classifiers, should be employed to separate the coarse from the fine material. Where this is carefully done in some instances the canvas plant may be dispensed with. Tailings sometimes contain values which cannot be caught on concentrating machines or on canvas tables. In this case the gold is usually still imbedded in the grains of gangue mineral (generally quartz) and can only be freed by finer crushing. It then becomes a question of economics—will the additional saving resulting from fine crushing be justified by the increased cost by reason of decreased stamp capacity?

Graphic Method of Mapping Exposed Ore Bodies.

Written for the MINING AND SCIENTIFIC PRESS by G. W. MILLER, E. M., C. E., Butte, Mont.

If the metalliferous substance contained in mineral-bearing veins, or deposits, cannot be profitably extracted and their metals reduced and marketed at a profit, such substances cannot in a technical sense be

terial consumed, etc., are deducted from the gross value of ores (the unit used generally being expressed in cost per ton of 2000 pounds). It is not the object of this paper, however, to discuss these latter points, or to deal with negative quantities, so much as it is desired to add a small mite to assist in bringing about a more uniform system of sampling, and estimating the quality, quantity and gross value per ton of ore in mines. For this the following method is proposed:

METHOD.—This method has been tested and used quite extensively and with entire satisfaction by the writer, both in this country and in South Africa, and it has been found especially adapted for ore deposits lying in continuous sheets, or those of the fissure vein, contact, or bedded types.

This method necessitates four distinct operations, viz.: (a) Surveying and mapping the mine; (b) taking samples of the ore; (c) assaying samples and determining their specific gravity; and (d) estimating number of tons and gross value of ores and tabulating results.

SURVEYING AND MAPPING.—The first step to be taken in this operation is to make a fairly accurate but rapid survey of all underground and surface workings of the mine. From the data of this survey maps of the mine are prepared (if not already at hand). If the mine contains but one vein, one plan of underground workings, one or more cross-sections, and one graphic drawing is required, but if the mine consists of more than one regular ore vein, one graphic drawing, in addition, must be made of each vein, or separate ore body, or deposit. The accompanying drawings illustrate an ideal mine of one ore vein. Fig. 1 is the plan, Fig. 2 a cross-section, and Fig. 3 a graphic representation of the vein surface. The plan and sections are first prepared on a scale of 20 feet to the inch. The lines R—S, S—T are then layed off on the plan. S—T is made parallel to the general course or strike of the vein, and R—S at right angles to this, in a direction parallel with the general course of dip. To construct the graphic map (Fig. 3) on the same or separate sheet of paper draw several lines, viz., R—S, S—T, and lay off on R—S, the slope distances of each level, and the point of intersection with the surface at "X." Now the contorted sheet, or warped surface of the vein, is developed into an inclined plane by straightening out horizontally each drift until they are at right angles to R—S.

Lay off all shafts, winzes, stopes, etc., as shown in the drawing by taking the meandering distance of each from the line R—S, or the horizontal distance of each point as determined by making measurements on horizontal planes along the strike of the vein. This will cause the straight winzes, upraises, etc., to present a somewhat zigzag appearance; this is, nevertheless, the most simple, and at the same time correct drawing that can be made which will represent the true plane of any warped vein. The intersection of this plane with the surface of the earth will appear along lines following the general undulations of the vein outcrop. The distance, for instance, from the first level to the surface, or to the points B, E and G, are equal to the distances measured along the slope from the first level at the points d4, d9 and d22. Commencing on the bottom workings, at the points on the drawing 1, 2, 3, 4, etc., the drawing is divided (where the edges of the ore body are exposed for sampling) into spaces of 5 feet, and the point where samples of the ore are to be afterward taken are indicated by placing opposite each point the sample number. These numbers should follow each other in the order 1, 2, 3, 4, 5, etc., as nearly as possible. (See Fig. 3.)

The shaded sections shown will be described later.

Having completed the maps of the mine up to their present requirements, it is in order to begin the operation of taking samples of all ores exposed in the mine workings and upon the surface outcrop of the vein.

TAKING SAMPLES OF THE ORE.—In beginning this work it is generally better to sample the drifts first, afterwards the winzes, shafts and upraises; next the stopes, and lastly the surface workings and vein outcrop. In following out the present system it has also been found best to make, first, a somewhat hasty preliminary sampling of the entire mine, taking samples at long intervals, say at 25 feet, 50 feet, or in some cases at even 100 feet apart, or at points where the ore body is most prominent.

These samples are assayed and their results given particular cognizance before proceeding further with the examination. This preliminary sampling serves two important purposes:

First.—It serves as an excellent guide to go by in selecting the final samples.

Second.—It may prove the mine valueless and consequently not worth a thorough sampling. This preliminary step should be taken as the first step in the examinations, and in some cases, indeed, even before making a survey of the mine.

But the mine now in view presents an ideal example, hence, we shall not stop to consider the more general cases; suffice it, for the present purpose, to follow out in detail the course as outlined in the particular case under consideration. Samples are taken across the vein, i. e., at right angles to the strike and dip, beginning at No. 1 as shown on the map. The spaces of 5 feet each are marked off in the workings, the proper number being given to each sample, which should correspond to the numbers on the graphic drawing. Samples are taken 5 feet apart in all cases. All high-grade streaks are sampled separately, and only such ground as will pay to work is sampled. This should be done in the same manner as the ground would be broken and sorted in stoping. A book record of all samples taken is kept, which should give the distance of each sample point from

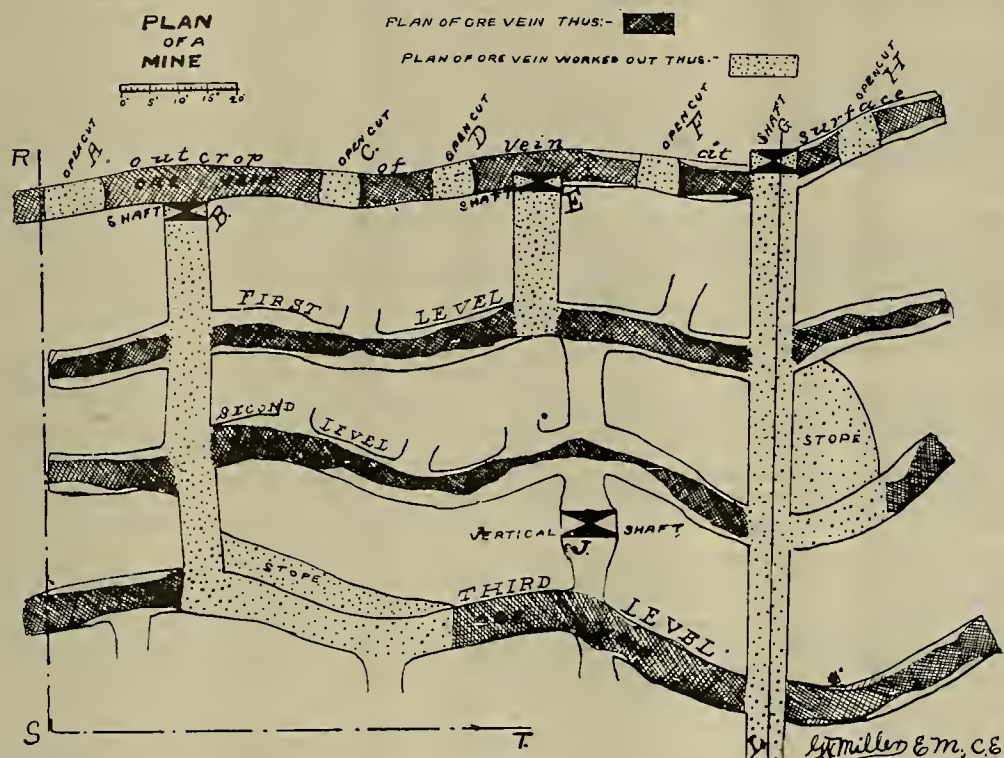


FIG. 1.

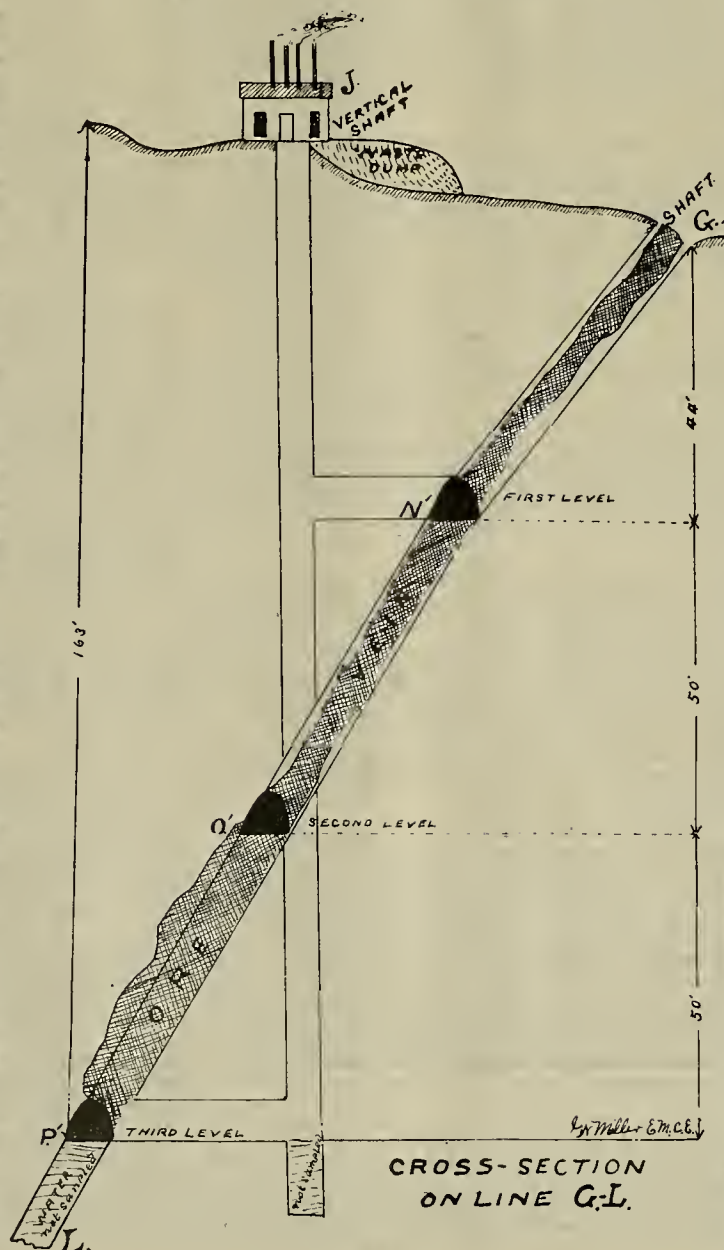


FIG. 2.

termed "ores." In the same sense neither can a mineral deposit be properly termed a mine, regardless of the extent of its development and other attending advantages claimed for it. On examining a mining property with a view of reporting upon its actual, or probable valuation, it is, therefore, of the utmost importance that the engineer, in the first place, determine from a thorough and systematic method of sampling the character and value of all ores exposed or in sight. Attention of its members has been recently called to these points by the London Institute of Mining and Metallurgy. The members of this Institute are instructed as follows:

First.—That the term "ore in sight" should not be used in reports without indicating the data upon which the estimate is based, and that estimates should be illustrated by drawings.

Second.—That "ore in sight," meaning ore blocked out or exposed on at least three sides within reasonable distance of each other, should be kept distinct from ores which may be reasonably assumed to exist, though not actually blocked out.

Third.—That in using the term "ore in sight" the engineer should show that this ore can be profitably extracted under the working conditions obtaining in the district. (See also my "Field Book of Practical Mineralogy," pages 25 to 33).

Keeping in mind the general text of the foregoing points it is obvious that with regard to mines in which the ore bodies have been blocked out, and on which a report is desired, the gross value of the ore thus exposed will in all cases form the fundamental basis for all subsequent considerations of the property as a profitable enterprise. This is apparent from the fact that all attending items of expense, such as cost of mining, reduction, transportation, interest on capital, repairs, ma-

some established survey point, together with a sketch showing the length, position and number of sample. The length of sample given in all cases, or wherever possible, is supposed to represent the full width of the vein measured at right angles to the plane of its dip and strike. From the shape of the exposed ore body these edges may not admit of taking samples directly perpendicular to the dip and strike; but as it is the width of vein which the samples are desired to represent, this distance and not the length of cut made in taking the sample is noted.

therefrom. The amounts selected should be from five to ten pounds of ore for each linear foot of trench; but, as the ores may vary much in specific gravity, in order to get uniform samples it is generally better to measure approximately the amount taken from each linear foot. This operation is best performed by an assistant catching the particles of ore as cut from the trench in a box or vessel suitable for the purpose, and estimating the proper amounts thus taken corresponding to each sample. The amounts taken

pose. This box should not be lost sight of at any time; it should be large enough to hold twenty-five 5-pound, or twelve 10-pound, samples.

Where the assays are to be made at a considerable distance from the mine, and the labor and cost of transportation is a consideration, the burden of excess weight may be lessened by successively quartering the samples down, using the same method universally employed in assay offices. So, if this work can be performed at the mine with the same degree of accuracy, matters may be greatly facilitated.

GRAPHIC ILLUSTRATION OF ORE IN A MINE

REVOLVED SECTIONS OF ORE TAKEN WHERE SAMPLED, AT RIGHT ANGLE TO PLANE OF VEIN: ORE STOPED OUT THUS:-

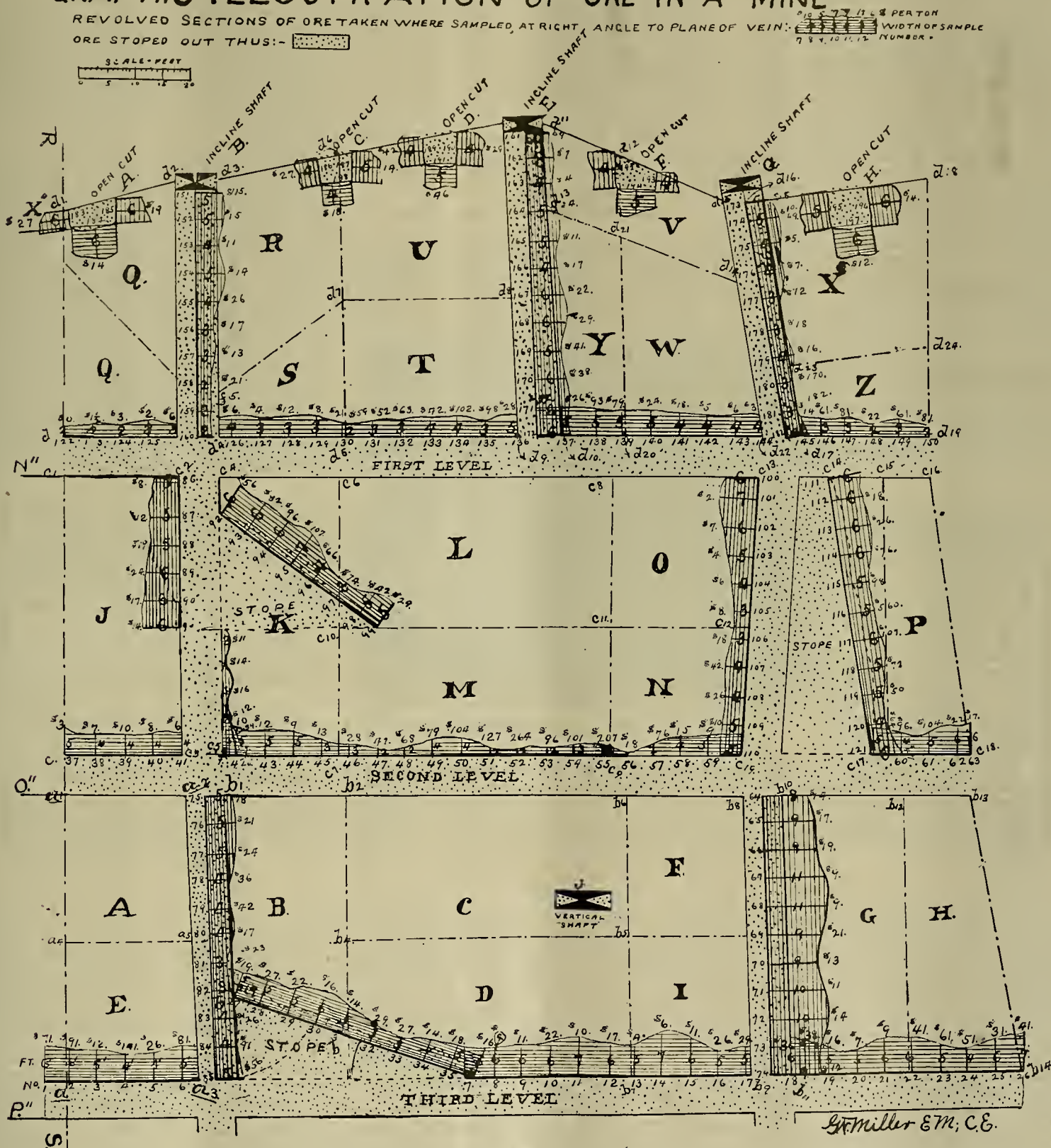


FIG. 3.

In sampling winzes, shafts, upraises, etc., and in some cases stopes also, where the vein is equally exposed on either side, half of the sample may be taken on one side and the other half on the side opposite. In such cases this would represent, from a series of samples taken, a perpendicular section through the center of the working (see incline shafts B, E, G, etc., on graphic drawing). All samples are taken as nearly as possible so that the volume of ore represented by each shall be proportional to the length of sample, i. e., to the width of vein at the point where the sample is taken.

The samples are taken by cutting shallow trenches across the edges of the ore body, and small particles of ore representing that remaining in place are taken

representing any one sample is dumped upon a heavy canvas and broken into smaller pieces; it is then quartered or halved, after a thorough mixing, and then repeating the operation until a small sample of the desired size is obtained. After this it is poured into a clean box or tin vessel, from which it is conveniently emptied into a small sample bag. The sample is now tagged on both inside and out with labels, bearing numbers identical with the one previously assigned to it on the graphic drawing and corresponding to the point from whence the sample was taken. The samples, after being prepared in this manner, in order to protect them from being tampered with, are securely locked up in a substantial tin, or light sheet-iron box, used especially for this pur-

ASSAYING SAMPLES AND MAKING SPECIFIC GRAVITY DETERMINATIONS.—As proof that painstaking precaution was observed all through the examination, and in order to guard against every possibility of being found in error (by some other engineer who might be called upon to check up the work from the data furnished, from start to finish, and with instructions to prove, if possible, the accuracy of each and every step taken in the present examination, by performing the work over again in a manner similar), it is generally more satisfactory for the engineer and his assistants to conduct in person the entire process of assaying and specific gravity determinations.

The methods used in this work should be fully explained and recorded. Duplicates of each pulped

sample should be labeled and stored away for future reference, to be used in case a check examination is ordered. The following method of specific gravity determinations has been used with advantage:

First.—Balance the specific gravity bottle on the scales; now fill to the brim with water, balance again, note the excess of weight added and call this A. This equals the weight of water in the full bottle.

Second.—Pour out a few drops of water and weigh again. Call this weight B.

Third.—Add the coarsely powdered ore until the water is again full to the brim; weigh and call this weight C.

Then, $\frac{C-B}{A-B} = G$, the specific gravity sought.

The necessity of mixing and grouping ores for specific gravity determinations is apparent, and the importance of this should not be overlooked.

ESTIMATING GROSS VALUE OF ORE AND TABULATING RESULTS.—Having obtained all necessary data for this, it is now in order to proceed with the last step of the work. This is done by first indicating upon the graphic drawing the position of each series of samples in profile sections. The bottom, or base of these sections, represents the lines from which samples were taken. The number of samples are those appearing along this line; the heavy lines drawn perpendicular to this represent the width of the vein at the respective points, while on the wavy line at top of the sections are recorded the gross value per ton of ore, in terms of whole dollars. It will be observed that the natural position of these sections is that with their planes standing perpendicular with the plane of the drawing, the positions shown in the drawing being that resulting from revolving each section upon its base line a2, a3, a— a3, etc., as an axis until the sections lie flat upon the plane surface of the drawing. The lines a1—a2, a2—a5, a5—a4, a4—a1, etc., outlining the plane base of the blocks of ore A, B, C, D, etc., are drawn as nearly as possible so as to group into separate blocks, and classify the ores of different grades or those which show uniformity in value.

The method of calculation is illustrated in tabulated form. (Fig. 4.)

Hence, $(a + h + c) V = ad + be + cf$, whence $V = \frac{ad + be + cf}{a + h + c}$.

Hence, rule: Multiply the area of each revolved section taken by its average assay value, add the products thus obtained together, and divide the sum by the sum of the areas of the revolved sections; the quotient equals the value per ton of the block.

TO FIND THE NUMBER OF CUBIC FEET OF ORE IN ANY BLOCK.—Rule: Multiply the area of its plan base by the sum of the average width of the revolved sections taken, and divide the product by the number of sections taken.

TO FIND THE NUMBER OF TONS OF ORE IN ANY BLOCK.—Rule: Divide the number of cubic feet in the block by 32 (there being 32 cubic feet in one ton of water of 2000 pounds) and multiply the quotient by the specific gravity of the ore.

Having the number of tons and value per ton, the gross value of ore recorded in the last column of the table is easily obtained.

Butte, Mont., March 1.

[Discussion in the MINING AND SCIENTIFIC PRESS of this and other articles of a scientific, technical or practical nature is invited.—Ed.]

Electrolytic Treatment of Arsenical Ores.

There is probably no gold-bearing ore which has been found as difficult of successful treatment in stamp mills as auriferous mispickel (arsenical iron sulphide). An extraction exceeding 40% of the assay value by the ordinary methods of amalgamation and concentration is unusually good. Much experimentation has been done on this class of ores.

What is known as the Westman process is described by the Electrical Review as having been successfully applied to the treatment of these ores, as follows:

It is claimed for the Westman furnace and process that not only is the danger from the escape of poisonous fumes lessened, but that the gold and silver present in the ore in small amounts are obtained in the residue in a form that leads to a profitable re-

Bear Gulch Tin District, South Dakota.

Written for the MINING AND SCIENTIFIC PRESS.

In the northwestern part of the Black Hills of South Dakota, and extending over into Wyoming, is a district of unusual interest, as in it occur mines of both gold and tin. The district was one of the first to attract the attention of early prospectors, who discovered the rich placers of Bear gulch, Potato creek and Nigger hill. The geology of the region is simple. The rocks are mica schist, mica, slate, and other crystalline varieties of Archæan time, intruded by dikes large and small of pegmatite of exceptionally coarse crystallization, greatly resembling those of the Southern Hills in the Harney Peak region, from which it is separated by a distance of 65 miles. The granitic intrusions of the latter region are in direct line with the Harney granites and they may possibly have a deep-seated connection. This is something that will, in all probability, never be determined, as any such connection would be at a depth so great as to be far beyond the reach of human possibility.

The gold in the placers occurred not only in the beds of the gulches and ravines of the region but also on the summits of the highest hills. Of these latter Nigger hill was the most noted example. This eminence is a comparatively smooth, flat-topped hill, from the east of which radiate several shallow "draws" or gulches. Bedrock was from a few inches to 4 feet deep, and in the alluvial was found coarse gold—not always on bedrock, but often some distance above it, and in some instances even in the grass roots, while in places no gold was found on the bedrock beneath. An ounce or more per day to the man was taken out by many with rockers and limited water supply in the first season's mining in 1876. These deposits, however, were quickly exhausted and attention was given to the deeper gulch placers. The miners were greatly hampered in their sluicing operations by the abundant occurrence of black sand and small pebbles of high specific gravity which filled the riffles and caused a loss of gold. For several years the true nature of this black sand was unknown, and being considered iron of no real value

BASE PLAN OF BLOCK				REVOLVED SECTIONS SAMPLED					CALCULATED VALUES OF BLOCK				
LETTER NUMBER	BOUNDARY DISTANCE	SQ. FT. AREA	BOUNDARY LETTERS	SAMPLE NUMBERS	LENGTH	AVERAGE WIDTH	SQ. FT. AREA	VALUE PER TON IN \$	CALCULATED VALUE PER TON OF BLOCK	NO. CU. FT. IN BLOCK	SG. OF ORE	NO. TONS OF ORE IN BLOCK	ASSAY VAL. IN \$ OF ORE IN BLOCK
A	26'	559.	a1-a2-a5	37-41	21	4.50	94.50	6.80	\$17.21	2515.5	2.7	212.25	3652.84
	21' 22'		a4-a1	75-80	24	4.50	108.00	26.33					
B	20'	730.	b1-b2-b3	42-46	20	4.20	84.00	12.40	\$20.48	3443.2	2.1	290.52	5949.85
	40'		-b2-b1	75-82	83	4.75	156.75	24.33					
	33'			27-31	21	5.20	109.20	21.16					
C	25'	1250.	b2-b3-b5	46-56	55	2.45	134.75	103.09	\$45.51	4806.2	3.0	450.57	20505.64
	50' 50'		-b4-b2	32-13	50	5.24	262.00	15.90					
D	25'	975.	b4-b5-b7	31-7	50	5.20	260.00	16.00	\$16.00	5070.0	2.7	427.76	6844.16
	50' 28'		a7-b3-b4	7-13									
E	24'	540.	a4-a5-a3	1-6	27	5.00	135.00	70.33	\$56.15	2430.0	2.7	205.01	11511.31
	22' 23'		-a2-a4	80-85	25	4.00	100.00	37.00					
R*	22'	704.	d3-d6	151-159	39.	3.67	143.13	15.22	18.34	2699.8	2.6	219.36	4023.06
	26' 38'		d1-f-d3	151-187	25	4.00	100.00	23.20					

FIG. 4.

In the first column of this table is recorded the letter numbers representing the plane base of the blocks of ore or plan of block; in the second is given the dimensions in feet; these dimensions generally represent trapezoidal figures, the top number of which equals the altitude, and the last two the top and bottom bases. In the third column is recorded the calculated area of the trapezoidal planes, or plan area of each block. In the fourth column is given the sample numbers indicating the length and position of sections sampled. Thus, 37—41, etc., means that the distances and values of that revolved section is used from No. 37 to No. 41, including all intermediate points; the numbers, 21, 24, 20, etc., appearing in the sixth column, equals the true length of the sections. Column eight gives their area in square feet, as calculated from columns six and seven, and column nine the average assay value of each. In the remaining columns the calculated value of blocks are determined as follows:

TO FIND THE EQUALIZED VALUE PER TON OF ANY BLOCK.—This is derived from the average values and areas of the revolved sections, which are taken to represent the thickness of any block, and is based upon the following principle: Let a, h and c, equal the separate areas of the revolved sections d, e and f, the average value per ton of each in their order, in terms of dollars, and V, the equalized value per ton of their sum. Then:

$$\begin{aligned} a \text{ square feet at } \$d \text{ per ton} &= ad \\ b \text{ " " " } \$e \text{ " " } &= be \\ c \text{ " " " } \$f \text{ " " } &= cf \end{aligned}$$

covery. The furnace is closed to exclude the air, and the heating occurs by means of an alternating current and cast-iron electrodes cooled by water. The arsenical ore is charged on to the hearth of the furnace, which is covered with a molten layer of lead, and any gold or silver present is dissolved out and retained in this bath of molten lead. The volatilized arsenic arising from the furnace is conducted away to a series of condensing chambers provided with partition walls and bottom doors, and it is condensed in these in the form of grey particles of the metal. The Arsenical Ore Reduction Co., of Newark, N. J., has been formed to work this process in America, and it was stated in October, 1901, that operations were about to be commenced with rich mispickel ore (arsenical pyrites) from Ontario, Canada. When operating with this ore the sulphur combines with the iron, and only the arsenic volatilizes. In the preliminary trials with the process it was stated that 1,270 kilowatt hours were required for smelting one ton of the ore, but this figure would appear to be a misprint for 1270 kilowatt hours. The development of the Westman process will be handicapped by the fact that the arsenic is obtained as metal, and that a further roasting operation will be necessary to obtain it, in the form of the white arsenic (As₂O₃) in which it is chiefly used in the arts and industries. Unless great care is exercised in choice of ores the product is also likely to be much contaminated with other volatile elements, of which sulphur, antimony, cadmium and zinc are the most common examples. However, in spite of these hindrances, the process may develop.

many tons of the troublesome stuff were dumped into the tailings piles in every gulch in the district. About 1880 the discovery was made that the heavy black sands consisted, in part at least, of cassiterite, and a search for the veins from which the stream tin came soon resulted in finding that it came from the intruded granite dikes. Tin stone was discovered about the same time in the Southern Hills in the Harney region.

These dikes vary in width from 3 or 4 feet to over 100 feet, and some of them outcrop continuously for more than a mile in length. The dikes are very interesting as they contain an unusual variety of minerals. The most important from a mineralogical standpoint are quartz, orthoclase and mica (muscovite) the essential constituents of granite. Associated with these are albite, apatite, hiotite, tourmaline (black), and numerous other minerals which occur more sparingly and are irregular in distribution.

Other minerals also are found which are chiefly interesting for their economic importance. These are gold, cassiterite, wolframite (iron-manganese tungstate), and columbite-tantalite (niobate and tantalate of iron and manganese). These minerals are all of high specific gravity and are found in the sluices.

Some of the larger granitic dikes are intruded by small, dark-colored dikes, possibly diabase. Beside the granitic dikes there are numerous quartz veins, and at the distance of a few miles are abundant eruptive rocks—rhyolite, phonolite, trachite, etc.

A large amount of gold has been mined in the district, but unless the gold-bearing veins and dikes be

came steady producers tin will probably form the most important economic mineral found in this corner of the Black Hills. Recently this district has again attracted attention and companies have been formed to mine for tin, though doubtless the other minerals will be given the attention their importance deserves.

W. H. S.

Copper Mining in Upper Michigan.*

NUMBER II.

Written by J. F. JACKSON.

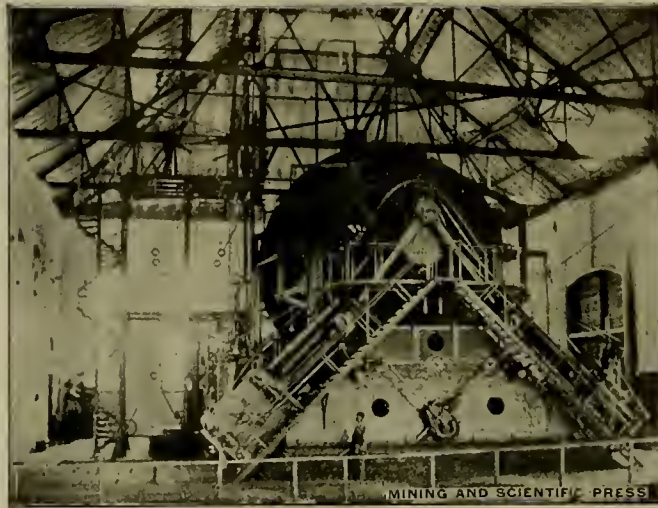
The Quincy has shafts 5400 feet deep on the incline and is culmied to go 7000 feet. The Calumet & Hecla has a shaft 6000 feet deep. At intervals of 100 feet in depth, levels or drifts are run out to the right and left. They are, at first, only 6 or 8 feet in width by 7 feet in height. The drifts are connected from shaft to shaft at different levels, to give ventilation. To begin the work of developing a mine, it is necessary to install a temporary equipment. A head frame, an air compressor, and hoisting plant of small capacity are put in. If, as the work progresses, the mine shows promise of becoming a profitable producer, dwellings for employees, office buildings, machine, carpenter and blacksmith shops, rock houses and permanent compressor and hoisting plants have to be provided at the mine, and a stamp mill built to separate the copper from the rock. This is the era of development and requires from three to five years of time, and an expenditure of \$1,000,000 to \$2,000,000 to bring the mine to a point where it can produce 1000 to 2000 tons of rock per day. The underground development may, in this time, aggregate 3 to 5 miles of shafts, drifts, winzes, crosscuts, etc. All mining is done with air rock drills of the Rand or Ingersoll-Sargent type, and the miners generally work by contract in parties of four, two by day and two by night. They are paid by the lineal foot of shaft or drift. When the million or two dollars have been expended and the mine and mill are ready to begin regular production, the drifts are enlarged and "stopping" begins; that is, the miners begin at points where there are good showings of copper to work upwards toward the level, which is 100 feet above them on the incline. Stopping is paid for by the cubic fathom. The stopping is conducted at different mines according to different systems, which depend largely on local conditions. The rock which the miners break down from overhead by the use of dynamite is loaded into tramcars by trammers and pushed by hand or hauled by electric locomotive to the shafts where it is dumped into skips, which hold from four to six tons of rock, and are hoisted to the surface or rather into the rock house. In the rock house it is dumped over screen bars which allow the fine pieces of rock to go directly into the rock bins, while the larger pieces are broken in Blake crushers to sizes which will pass through a 4-inch opening. In the rock house waste rock containing no copper is thrown out, and pieces of mass copper from a few pounds in weight to a ton or more are freed from rock by a steam bammer and sent direct to the smelter.

A notable exception to the general way of opening a mine is found in the Red Jacket shaft of the Calumet & Hecla mine, and in the five shafts of the Tamarack mine. The Red Jacket shaft is 4900 feet deep. No. 1 Tamarack is 3240 feet deep, No. 2 is 4143 feet, No. 3 is 4713 feet, No. 4 is 4450 feet and No. 5 (4662 feet to the lode) is now 4980 feet deep. In this case the Tamarack does not own any of the outcrop of the Calumet lode, but the lode passes under its lands at great depth. One can imagine that it must have required some courage on the part of the projectors to sink the first deep vertical shaft to encounter a lode which might or might not contain copper at the point where intersected, or, later in the history of the mine to start No. 5 shaft, which should require five years of time and a million of money, simply to get down to the lode at a depth of 4662 feet with the hope of finding rich copper ground. A valuable paper by W. E. Parnall, Jr., on the sinking of this, the deepest shaft in the world, may be found in the seventh volume of "Proceedings of the Lake Superior Mining Institute." In the case of vertical shafts, the shaft intersects the lode at only one point, and the levels above and below this point must be reached by crosscuts of constantly varying lengths which run from the shaft to the various levels. When the shafts are vertical, the tram cars loaded with rock are hoisted to the surface on cages resembling an ordinary passenger elevator in a tall office building.

We will follow the copper rock a little farther and return to the subject of hoisting and hoisting engines later.

Supposing now that the waste rock and mass copper has been taken out in the rock house, and the stamp rock which constitutes the bulk of the rock hoisted from the mine to be crushed to pass a 4-inch screen, the stamp rock is loaded through chutes into drop-bottom ore cars and hauled in trains to the stamp mills located 5, 10 or 20 miles away on the shore of Lake Superior or some inland lake. Stamp mills are located on a lake not only to procure an

ample water supply, but also to obtain room to deposit the immense amount of sand which is made by crushing in each mill from 2000 to 6000 tons of rock per day. The 6000 tons of rock banded daily by the Calumet & Hecla mean 5000 cubic yards of sand per day, or 1,500,000 cubic yards per year. Its disposal, therefore, becomes an important problem. At the stamp mill the copper rock is dumped from ore cars into large elevated bins, from which it flows in a continuous stream by gravity into the mortars of the steam stamps. Water is admitted to the mortar at the same time and the rock is pulverized by blows from the steam bammer into particles small enough to splash through the perforated screens which surround the mortar. The size of these perforations varies from three-sixteenths inch diameter to five-eighths inch diameter. Each stamp mill will reduce to powder and sand about 500 tons of bard copper rock per day. About 4,000,000 gallons of water per day are required for each stamp head. The water and sand carrying particles of copper flow through separator boxes. The heavy particles of copper seek the bottom of the stream and are diverted from the main stream by adjustable valves. This portion of the flow containing most of the copper and some rock particles is then passed over a series of jigs where, by a gentle pulsing action produced by plungers, the copper settles on wire sieves and the rock particles pass over into the waste launder. The finer grades of copper are removed from the main stream which leaves the separator boxes by means of huge round slime tables or by Wilfley tables. The principle in all these washing or concentrating machines is that the heavy particles of copper settle to the bottom on being agitated, while the sand, having less specific gravity, is washed away by the flow-



Hoisting Engines at No. 5 Shaft, Tamarack Mine, Michigan.

ing water. The waste launders carry the sand and water several hundred feet to the lake where it is dumped.

The 1%, 2% or 3% of "mineral," which is the name applied to the product of the stamp mill, is next shipped to the smelters, usually only a few miles away. At the smelter this mineral, now 60% to 80% pure copper in the shape of small grains, together with the solid chunks of mass copper from the rock houses, is reduced in reverberatory and cupola furnaces. The principal flux used is limestone. During the process of refining, green poles are thrust into the molten metal. This process is called "poling," and tends to bring impurities to the surface where they are run off as slag. When the refining has been completed the molten metal is dipped from the furnaces and cast into ingot, cakes and wire bars, as may be required. Copper for wire bars and for cart-ridges must be of very great purity, tensile strength and conductivity. Copper from the Calumet & Hecla, Osceola, Quincy and Wolverine mines is particularly adapted for wire for electrical purposes. Lake copper is usually quoted one-fourth cent per pound higher in the Eastern markets than the electrolytic brands from the West. Western brands go largely into copper sheets, tubes, brass castings, bronzes, alloys, coinage, etc. There is a wire mill in our district from which quantities of wire of all sizes are shipped direct to consumers. Copper for electrical purposes is refined until it contains less than .1 of 1% of impurities.

It may be conceived that for a single mine to break out and hoist from a mile below the earth's surface a daily product of sufficient rock to fill a train of heavy ore cars $1\frac{1}{2}$ mile in length, and to transport the 7000 tons of rock to stamp mills; to pulverize the same to fine sand by steam bammers, and to separate the copper therefrom, must require the expenditure of considerable energy and that problems of great engineering interest must have been met and solved during the development of the business to its present proportions. There are now employed at the Calumet & Hecla 5000 men, at the Tamarack 1500, at the Osceola 600, at the Quincy 1000, and fewer at

the smaller mines. The aggregate number of employees in Houghton county is about 14,000. The yearly product is about 200,000,000 pounds of copper, of which the Calumet & Hecla produces 90,000,000. Having given a crude description of the general process of producing copper, I will now call attention to a variety of accomplished facts which may be of some engineering interest. In the first place, taking a trip to the bottom of a mine on the incline track or down a vertical shaft is not without a tinge of excitement to the inexperienced traveler. Arriving at one of the bottom levels, however, you find yourself in a dry and comfortable tunnel, which you can explore without inconvenience. The temperature is about 85° F. and increases 1° for each 112 feet in depth. You note how rock is broken from the stopes by miners, loaded into tram cars, pushed or hauled to the shaft, and dumped into skips, which run in balance on parallel tracks—that is, the empty car goes down while the loaded one goes up. One cable winds on the under side of the drum, while the opposite one unwinds from the upper side, and vice versa. You are told that the skips are hauled up at the rate of 40 or 50 miles an hour, and you hope your car will travel a little slower and wonder whether the 1½-inch cable will break or the car jump the track while you are going to the surface. Arriving at the surface safely, you naturally want to take another look at the hoisting engine which operates the skip, and find that the drum on which the cables are wound is 26 feet in diameter and 16 feet long, and that it is turned 40 revolutions per minute by two 48x84-inch engines attached directly to cranks at each end of a 16-inch shaft, upon which the great drum is mounted. Brakes and reversing gear are all operated by

steam. One man has perfect control of the entire machine and obeys signals conveyed to him by bell wire from the mine. A description of the first great Quincy hoist may be found in Engineering News of April 18, 1895. Its nominal horse power is 2500. Should you go down the 5000-foot vertical shaft, known as Tamarack No. 5, you would learn some new facts of interest. When the shaft was completed about two years ago, and it became necessary to bang plumb lines in the shaft from which to start the underground surveys, fine steel piano wires and 48-pound bobs were used. The wires stretched several feet, but were adjusted to length. They did not come to rest readily, so a vessel of water was placed underneath for the bob to swing in. When this was done it was found that owing to the buoyancy of the water a new adjustment had to be made. On coming to rest, or nearly so, it was found that the wires were 1 inch or so farther apart at the bottom than at the top of the shaft. When this fact became public a number of scientific gentlemen began to construct theories of the attraction of gravity and magnetic currents to account for the phenomenon. After some months of very thorough investigation by President McNair of the Michigan College of Mines, the fact was revealed that the divergence of the wires was caused by air currents in the shaft and not by gravity or magnetic currents. Another curious fact was also brought out by President McNair. He suspended a polished steel ball 2 inches in diameter at the top of the shaft by a thread. A man was stationed in a safe place in the bottom with a telephone and a stop watch. The thread was burned off and the man below notified at the same instant. They wanted to find out how long it would take the ball to fall to the bottom. The man below waited, but heard nothing whatever of the ball. It never reached bottom. On inquiring, President McNair was informed that particles of rock dropped into the shaft at the top seldom reached bottom, but lodged among the timbers with which the shaft is lined. The explanation of this phenomenon is found in the fact that the earth revolves on its axis with a greater velocity at the surface than at a point 1 mile below.

Those who are curious about this matter may figure it out for themselves.

(TO BE CONTINUED.)

German Copper Consumption.

Following are the figures of the German consumption of foreign copper for January, 1903, compared with the same period of 1902 and 1901:

	1903.	1902.	1901.
Imports, tons.....	6,829	4,469	6,534
Exports, tons.....	795	860	775

Consumption of foreign, tons. 6,034 3,609 5,759

With a head of 132 feet the equivalent pressure would be 57.16 pounds per square inch, and the corresponding theoretical horse power would be 3.34.

*Trans. Jour. West. Soc. Engrs., condensed.

Witwatersrand Gold Fields.*

The Witwatersrand gold fields are located on an elevated plateau, nearly 6000 feet above the sea. The Witwatersrand (or white waters ridge) projects somewhat above the plateau, and the outcrop of the conglomerate reefs can thus in a measure be said to be the dividing watershed between the Atlantic and Indian oceans, the tributaries of the Vaal river draining into the Atlantic and those of the Limpopo or Crocodile river to the Indian ocean. The conglomerate beds of the Witwatersrand are composed of quartz pebbles bound together by a siliceous cement containing iron pyrites. The name "banket" has been given to the conglomerate from its general resemblance to an almond sweetmeat with this Dutch name, which, however, refers specially to the ore taken from the oxidized zone, which in the early history of the fields was called "free milling," and found to extend to only a limited depth. The gold contained in the conglomerate is not often visible to the naked eye, occurring almost invariably in the matrix, its existence in the pebbles having been recognized only in rare instances. The gold is for the most part in very fine particles, and when examined under the microscope shows sharp crystalline structure, giving no evidence of being rounded and moulded by attrition, as is observable on examination of gold found in alluvial deposits. There are several series of these conglomerate beds in planes more or less parallel to each other. The most common designation of them, starting from the lowest geological horizon, is as follows: Du Preez series, Main Reef series, Bird reef, Kimberley series, Elsherg and Black reefs.

Exploitation has proved that the reefs where steeply inclined at and near the outcrop have a tendency to flatten in depth; and, conversely, where the outcrop region shows an abnormally low angle of inclination there is generally an increase in the immediate dip region, thus indicating a probability of approximation to uniformity of inclination in the deeper levels throughout the whole area. Gold is found as an essential constituent in all the banket beds included in the foregoing list, but thus far the Main Reef series has chiefly justified extensive exploitation, and even here only within certain limits.

WORKS OUTSIDE MAIN REEF.—Besides the companies whose production is connected with the Main Reef series, twenty-eight companies have worked on the Du Preez, Kimberley, Steyn estate, Elsherg and Black reefs. Some parts of the Heidelberg district, such as the Nigel, may be considered to be on the southern rim of the syncline of the Main Reef series, and six producing companies have operated here.

The production from the foregoing miscellaneous sources, aggregating \$15,169,601, may be summarized as follows:

Series.	Number Operating Companies.	Gold Produced.
Northern quartzites.....	2	\$ 5,407
Du Preez reef.....	3	5,260,754
Kimberley reef.....	7	340,449
Steyn Estate reef.....	1	245,895
Elsherg reef.....	1	848
Black reef.....	14	2,834,286
Heidelberg District—		
Nigel reef.....	5	6,274,329
Heidelberg Roodepoort mine.....	1	207,633
Totals.....	34	\$15,169,601

EXTENT OF THE FIELDS.—The distance along the strike of the reef from Randfontein on the west to Holfontein on the east is 62 miles, throughout which extent the reef has been almost continuously traced. Of this area, the central section for a distance of about 12½ miles has produced about 76% of the gold won. Conglomerate beds have, however, been traced over a far greater area, and correlated by geologists with the Witwatersrand series. It has been stated that there is continuity proved by outcrops and borings for 16½ miles, continuity concealed by more recent measures for 123 miles, continuity interrupted by faults and dykes for 31 miles, making a total of 308 miles.

As the subject of the genesis of the conglomerates and gold contained therein is open to much difference of opinion among geologists and engineers, it will be unprofitable to attempt to deal with it in detail. The most generally accepted theories seem to be that the conglomerate beds and enclosing sandstone and quartzites were seashore deposits formed during subsidence of a coast line; that after their deposition and consolidation the banket-bearing strata were folded into anticlines and synclines. North of Johannesburg subsequent erosion removed the anticline. The deposition and erosion in connection with the syncline have been such that a statement of a basin-shaped deposit has much justification. The beds have been subjected to fault and dyke action, which has broken them extensively in places.

DEPOSITION OF THE GOLD.—The origin of the gold within the beds can be considered as: (1) prior to the formation of the conglomerate; (2) contemporaneously with the formation of the conglomerate;

(3) subsequently to the formation of the conglomerate. The advocates of (1) assume that the gold and pebbles alike are the products of erosion or denudation of an older formation containing quartz veins; (2) requires the hypothesis that the sea was very shallow and contained a saturated solution of gold and iron sulphide, coupled with precipitating agencies; (3) this is the impregnation theory, assuming the gold and pyrites to have been deposited in the beds by infiltrating solutions, the mineral solutions seeking the planes of least resistance—i. e., filter bed of the banket, the deposition of the gold and other metals being thus brought about as in quartz veins. This latter theory is the most accepted by engineers here.

REEF CHARACTERISTICS.—The classification of the Witwatersrand beds seems a simple matter when looking at any one section, but in reality is complex. Even in the Main Reef series there is great variation in the number, distance apart, and thickness of the beds, and there is much diversity of opinion regarding their correlation, on account of extensive and complex faulting, especially in the extreme eastern and western sections. The value of banket ore cannot generally be gauged by mere inspection, and, to establish the average gold contents in the ore comprised within a given area, very elaborate systems of sampling are introduced, which involve the careful sectioning of the reef at 5—or at most 10—foot intervals, and the application of the law of averages. The necessity for these careful methods arises from the fact that the gold contents of the reef fluctuate sharply, as from point to point, and accordingly the average value can be arrived at only by the introduction of a mathematical scheme of averages. The existence of pyrites might be thought a good index, and as a general indication this is favorable, as gold is rarely found in the banket unless associated with it; but, on the other hand, pyritic impregnations are frequently found containing little or no gold. The pay banket may vary in thickness from a few inches to 15 or 20 feet. The encasing rock may be soft sandstone or hard quartzite. The dip of the beds may vary from vertical to horizontal. The mine may be wet or dry. The depth from which ore is hoisted may vary from 100 to 200 feet up to that of 2000 to 2500 feet. The amount of waste rock—that is, quartzite or other rock containing little or no gold, which is dislodged by blasting operations—that is sorted out from the reef proper varies between nothing and 40%. This process of sorting out as practiced here amounts simply to the rejection of valueless material. The mining ores may be a home for faults and dykes, or the reefs may be found free from serious disturbances. Thus it is unreasonable to expect uniform cost of extraction—when comparing one mine with another—any more than uniform yield. The great reputation these fields justly have for security and regularity is in gold mining merely relative and based on the law of averages. Gold mining as a business in other parts of the world has been recognized as the acme of speculative investment. Here, though capricious as units, the mines are as a whole regular, within certain fixed limits, and it is perfectly true that greater reliance can be placed on the continuance of the deposits than has ever before been known in gold mining, and therefore large preparatory outlays on the basis of a staple industry are more justifiable.

EFFICIENCY OF WORKING.—Up to the time of the discovery of the Witwatersrand deposits no auriferous conglomerates had been worked on a large industrial basis in any part of the world. At the start, therefore, these fields were unique as to general experience, and consequently the engineer had to grope his way, and the capitalist had to follow cautiously or risk rashly. One of the early difficulties was the unsatisfactory extraction of gold from the ore. At first not more than 50% to 60% was obtained by the amalgamation process. Later on concentration and chlorination of concentrates improved matters, but it was not until the chemical treatment of all the sands and slimes by the cyanide process was introduced that satisfactory results in this regard were reached. Now it may be said that the average well-equipped mine can recover 85% to 90% of the gold contents of its ore. The investor has gradually realized that, in order to secure the best results and put his property in a position to make profits with the low-grade ore, a large amount of development work, big mills, cyanide works and great capital outlays in many directions are required.

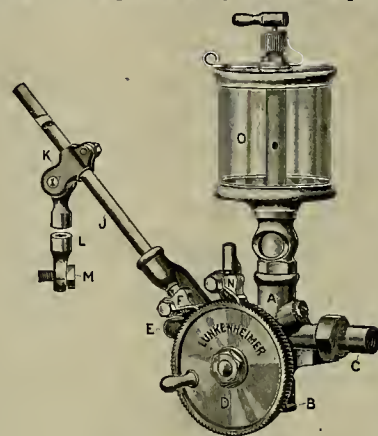
It has been estimated that on an average it must have cost companies at the rate of about \$25,000 per stamp for development work and all capital outlay connected with their mines. There have been at least 6000 stamps erected on these fields, which would make the total capital outlay for producing companies figure at about \$150,000,000. This makes no allowance for non-producing companies, or for the great outlays in Johannesburg in connection with central administrative control. A check on this estimate is shown by examining the capital expenditure for sixty-eight companies, when it is seen that on a stamp basis this works out at \$23,217.

A CUSTOM MILL in a district of small mines can often make success possible if the proper relations exist between the miners and mill owners, and

where, if the mines were each equipped with a mill, failure and idleness would result. To this end the mill owner should make a fair and equitable charge, returning to the miner as high a percentage of the values in his ore as can be extracted by a process suited to the ore. In this way several small mines may supply sufficient ore to keep a good-sized mill in constant operation where any one mine in the district would be unable to produce enough ore to steadily employ a small mill.

Lunkenheimer Mechanical Oil Pump.

In the illustration of the Lunkenheimer mechanical oil pump it will be noted that the driving mechanism is of the ratchet type and is operated by the clutches F and N that work co-operatively by the motion of the rod J, which can be attached to the eccentric rod, or other moving parts of the engine, by the couplings K and M. The motion thus obtained is transmitted to the piston E by the crankpin mech-



Mechanical Oil Pump.

anism H and G. The ratchet wheel D is provided with a handle whereby it can be rotated by hand in case it is desirable to force a quantity of oil at any time, as, for example, when starting the engine.

By moving the part K up or down the rod the stroke of the pump can be lengthened or shortened, as desired, thus regulating the amount of oil fed by the pump, independent of the feed from the oil cup. The joints of the cup are tight, the sight-feed glass being packed so as to prevent the access of air that would have a tendency to cause the cup to feed after the engine had ceased running. This construction and the use of check valves in the pump prevent oil supply from flooding.

The outlet C is piped to the steam pipe or chest of the engine, and the spring check valve X should be placed as near the end of the pipe as possible, preferably into the steam pipe.

The bottom of the pump body B is tapped ½-inch pipe thread to receive a stand so that it can be placed wherever desired. The ratchet wheel D and pawls F and N are made of tool steel, tempered and hardened. All other metal parts about the pump are hard bronze composition.

This oil pump is manufactured by the Lunkenheimer Co., Cincinnati, Ohio, U. S. A.

The Bingham District, Utah.

The report of the United States Geological Survey on the areal and economic geology of the Bingham Canyon district, Utah, by A. Keith and J. M. Boutwell, is now nearing completion. It embodies four main parts, which are devoted to history and development, surface geology, economic geology, and detailed descriptions of mines. Bingham is the oldest camp in the State, and the only one in which placer mining proved successful. In the discussion of the development, methods of mining and plants for reduction are described.

The text on the surface geology includes descriptions of the formations, their strike and deformation or faulting, and the porphyry intrusions, and are elucidated by means of a colored geological map and by structure sections. The economic portion gives a statement of the general characteristics of the ores and a detailed description of each species of mineral among those constituting the ores, and contains a discussion of ore values. The study brings out several new points of commercial value. A chapter on auriferous gravels deals with the history of this branch of mining, the distribution of pay, and the origin of the deposits, and closes with a discussion of future possibilities.

A detailed description of the underground geology of each property is presented, with illustrations showing their characteristic features.

This report will probably go to press early this summer, and, when published, may be obtained upon application to the Director of the United States Geological Survey.

Another interesting publication will be the Topographic Map of the Bradshaw Mountains, Arizona. It covers an area of about 1000 square miles, lying between Prescott and Phoenix, and includes a large part of the Prescott forest reserve. It is on a scale

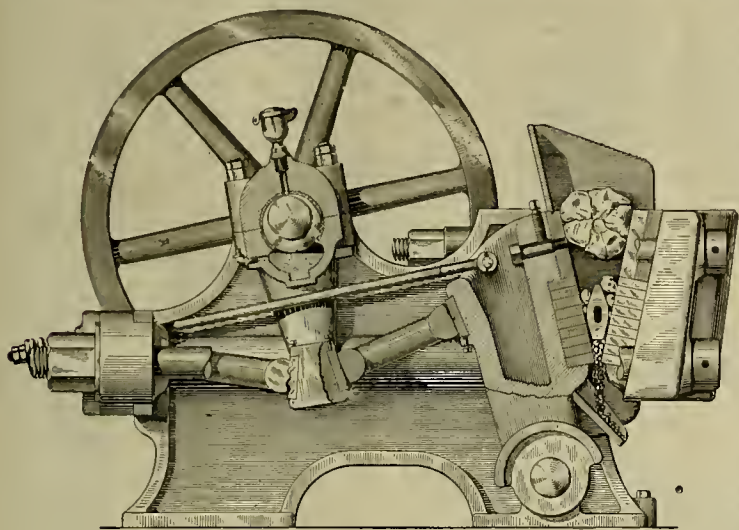
*Abstract of report on gold mining industry of the Rand for the Chamber of Mines.

of about 2 miles to 1 inch. Elevations above sea level are given in figures to the nearest foot for all important mountain peaks. Elevations of other points are shown by contour lines, representing vertical intervals of 100 feet. All important mines, all roads and towns, as well as each detached house, are accurately located. These maps are sold at the nominal price of five cents each.

The development of this region has been retarded by the high cost of transportation and the scarcity of water. A railroad line now under construction from Mayer to Crowned King, with numerous spurs, will reduce the transportation cost.

Rolling Toggle Crusher.

The Krom rolling toggle crusher herewith illustrated is stated by the makers to be the result of many years experience in crusher building. The main frame, consisting of the sides, front jaw and back abutment, are separate pieces, enabling it to be shipped or installed in sections where necessary. The frame is bolted by steel bolts upon which all the crushing strains on the frame are designed to fall. The movable jaw is pivoted at the bottom, thus producing the smallest movement at the bottom of the



Rolling Toggle Crusher.

crushing faces with intent to give a uniform product. The jaw faces are of bars of hardened tool steel, made interchangeable. The lower bars wear first, and when so worn as to increase the size of the product they are to be replaced by the upper bars. Inserting a liner between the front and side frames of the main frame adjusts to crush to size desired.

Two heavy flywheels, of which either can be used as a drive pulley, furnish momentum to carry the eccentric over the load point, thus tending to reduce horse power. The toggles are of steel and roll on their seats, minimizing friction, there being no rubbing, no wear, and no oil being used.

The shaft bearing in side frames and pitman have large oil wells provided with chain oilers. The jaw shaft bearings are in removable glands, which fit over the ends of the shaft and press against packing at their inner ends to make a dust-tight chamber.

The bolts of the pitman cap are proportioned to break before any expensive part. These crushers have capacity for heavy work. They are made, by the Krom Machine Works, Jersey City, N. J.

Steam Turbines.

A recent computation has placed the total aggregate power of steam turbines in use or under construction or ordered in different parts of the world at over 500,000 H. P. Of this total the major portion is used, or to be used for the driving of dynamos, alternators or other electrical machinery, while the next in point of power consumption is marine engines. A contract was recently given to the British Westinghouse Electric & Mfg. Co., Ltd., by the Metropolitan District Railway Co. of London, England, for four turbo-alternators. Each is designed for a normal capacity of 5500 kilowatts, but capable of carrying an overload of 50%, giving about 11,000 E. H. P.

The dimensions of these engines are 29 feet long by 14 feet wide by 12 feet high. The steam pressure will be 165 pounds per square inch and the speed 1000 revolutions per minute.

METALLIC MANGANESE does not exist in nature, but is reduced in small quantities at great expense from its ores. It is quoted at \$1.25 retail per ounce avoirdupois. It is used to a very limited extent in laboratory work. Manganese dioxide is worth from \$8 to \$12 per ton, depending on its purity. It is useful as a flux in some smelting operations; in the manufacture of certain grades of steel; in the generation of chlorine gas in the Plattner process of chlorination. It is also employed in the manufacture of various chemicals, being combined with potassium, cyanogen, iron, etc.

Manufacture of Portland Cement in California.

NUMBER III.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS
by R. P. McLAUGHLIN.

Samples of both materials are taken regularly in the stone house, and the required weights of each, as shown by the analyses, are set upon their respective scales by the chemist. A car of stone and a wheelbarrow of clay are, after weighing, simultaneously dumped into a hopper, and thus mixed as they fall into the bin, which is in the adjoining building below. The next step is the drying of the mixture which passes from the bin through a Challenge ore feeder into the upper end of a slightly inclined rotary drier. The drier is 50 feet in length, having a diameter of 5 feet. A 10 H. P. motor maintains a speed of about sixty revolutions per hour. Along the inside Z-bars form shelflike projections which carry up and redrop the material, insuring that it shall be thoroughly exposed to the current of air heated to about 300° F. In about thirty minutes after entering, the dried mixture drops out just above the furnace and is caught by a 16-inch belt conveyor. The fuel used in the drier, as in all the other furnaces in this plant, is oil, the heat being deflected toward the upper part of the cylinder by a brick partition.

The fuel oil used at this plant is received in tank cars heated, if necessary, by steam, and allowed to run into a wooden tank in a building at the stock house. At the tank a 10 H. P. triple-acting pump forces the oil to three 25,000-gallon wooden storage tanks in a building near the stone house at the top of the hill. Two pipe lines lead from the storage tanks—one to the drier, the other to the kiln—the oil flowing by gravity. Each line passes through a heater, consisting of an iron cylinder filled with hot water, through which the pipe passes several times. The water is heated by an oil burner beneath the cylinder.

The first grinding of the dried material takes place in two Krupp ball pulverizers, each of which is a cylinder of about 10 feet diameter and 4 feet length, revolving on a horizontal axis. Armor plates, with holes of about 1/4-inch diameter, compose the inside of the cylindrical surface. A number of steel balls about 6 inches in diameter help to pulverize the material as the cylinder revolves. From a bin above a shaking feeder introduces the stone at one end of the cylinder near the axis. Careful adjustment is required to prevent overfeeding and clogging. When fine enough, the material passes out of the holes in the plates and through two sets of screens, which encircle the cylinder and allow only material passing a screen of twenty meshes to the inch to leave the machine. About 90 H. P. is required to start a pulverizer; then 45 H. P. is used in maintaining a speed of twenty-five revolutions per minute. This type of machine requires 16 H. P. to 18 H. P. per hour per ton. The sketch (Fig. 1, page 180) shows the construction of this machine. A 10-inch screw conveyor takes the material to three cylindrical pulverizers.

The cylindrical pulverizer is of 1/4-inch boiler plate and is about 30 feet long and 4 feet in diameter, with several transverse perforated partitions. A 75 H. P. motor revolves it about a horizontal axis at a speed of twenty-five to thirty revolutions per minute. The grinding action is performed by flint boulders of about 4 inches diameter which half fill the cylinder. The coarsely-ground mixture enters at one end near the axis and comes out ground so that 95% will pass a 100-mesh screen and drops onto a belt conveyor. The three pulverizers are shown in the accompanying engraving (Fig. 2, page 180).

The critical point of the whole process of cement manufacture is reached at the kilns or furnaces, of which there are three in this plant. The furnace is a cylinder with a length of 60 feet, being lined with 8 inches of specially prepared basic firebricks, leaving an inside diameter of 6 feet. The cylinder slopes slightly towards the furnace end and is revolved by a 5 H. P. motor at a speed of usually about twenty-five or thirty revolutions per hour, depending on the working conditions.

Air is forced into the oil burners at a pressure of about thirty pounds. The amount of material admitted by the feeder at the upper end of the furnace depends directly upon the speed at which the latter is revolving and is regulated by the furnaceman. The speed regulator consists of two double cones revolving on parallel shafts, each double cone serving

as a pulley and carrying a specially constructed belt.

During the revolving the material works down the cylinder into an increasing temperature until the maximum of 3150° F. is reached at a zone about 8 or 10 feet from the lower end of the furnace, where incipient vitrification takes place, which is the vital cement-forming process. Progress is noted by the furnaceman, who is necessarily the most skilled laborer in the works, by looking with colored glasses through an opening near the burners. The hottest zone looms up distinctly against the dark background of the cooler material farther up the furnace, and the position of the zone relative to the end of the furnace indicates the condition. The black ring is brought closer to the observer by increasing the speed and feed and forced back by decreasing them. Protection to the lining in the lower end of the furnace is afforded by a patching of the partially fused material which is occasionally forced into place by an iron rod in the hands of a workman. Upon leaving the zone of maximum temperature, the fused material becomes slightly cooler and drops out at the lower end of the furnace at nearly white heat. The material is now called "clinker," and its appearance is accurately described by the name, it being a dark colored, porous mass, having much the appearance of coke. About 36% of the original weight of the material has been lost in the heating process, either as moisture or as carbon dioxide. The only stops of the furnace are for relining, which is only about once a year. Reserves of the material are accumulated wherever possible in the mill, to prevent any stoppage of the kiln.

The clinker falls below to a cement-floored room, where it is either allowed to accumulate or, as is usually the case, cooled. Elevation of the material being worked takes place for the first time as the clinker enters the coolers. Two 2 H. P. bucket elevators catch the hot clinker and carry it up above the roof into the tops of as many coolers. The cooler consists of an upright boiler-plate cylinder about 8 feet in diameter and 40 feet in height, provided with umbrella-shaped distributors and shelves which force the falling clinker to pass to and from the center of the cylinder. Air is forced into the cooler from below by fans, and by the time the clinker has reached the bottom it is cool enough to be fed out upon a belt conveyor below, as desired.

After cooling, gypsum is added to the clinker in proportions suited to the rate of setting desired in the finished cement. Gypsum is the only material which is shipped into this plant; but, as the largest amount used is only 2 1/2% of the weight of the cement, the amount required per day will average about three tons.

A final grinding now completes the process of making cement, and this is accomplished in a set of mills of the same type as those through which the limestone and clay passed before entering the furnace.

About six hours are consumed in the material passing through the plant. The product passes 100-mesh screens and is taken by a belt conveyor to the top of the stock house. This is the second and last elevation. A screw conveyor takes the cement along above the double row of storage bins to which it is distributed. The planks forming the front of the bins are removed, allowing the cement to run out on the floor, from which it is sacked and delivered to freight cars standing on either side of the building. Special care, of course, must be taken during storage to keep the cement absolutely dry, and in the stock house an exception is made to the general rule of buildings entirely of iron, the roof being of wood covered by roofing paper and iron on the outside, which combination prevents sweating and dripping. The stock house contains fourteen wooden bins of capacity of 2500 barrels. The cement is always kept in the bins at least thirty days before shipping, which has been shown to improve it, and also avoids deterioration of sacks caused by warm cement. For shipping, canvas bags and paper bags of 1/2-barrel, or 100 pounds capacity, are used. The advantage of sacks over barrels, which are necessary during water shipment, are economy of space and ease of handling, and a saving is effected by the sacks being returned for re-filling.

The economic production of cement depends upon careful mechanical manipulation; but the chemical side of the work, besides requiring constant care and attention, calls for considerable experience and a special study of the subject. When the deposits of clay and limestone have been located, there must be a long series of analyses showing that none of the injurious impurities exist in large enough quantities to prevent the making of cement. After the plant is completed, a chemist must be retained on the routine work. The chemist is required to regularly sample the raw materials in the stone house and figure the percentage of each to be run. A strict watch must be kept on the drier, and still more vigilance is required to maintain the proper conditions surrounding the fusing. Samples of the cement must be taken several times each day and night to keep a close check on the calculations of the charge. Cement of absolute evenness, both chemically and physically, must at all times be produced. Daily reports, showing the results obtained at different hours, are made to the superintendent.

The percentage passing a 100-mesh screen is the

most frequent test made on the cement as it passes into the bins, the requirement being at least 95%. A determination of the rate of time of setting is another task allotted to the chemist. Time of final setting is defined as the time from mixing until the cement will support a rod of fixed weight, and must not be confused with the time of hardening.

Physical tests are regularly made, the most usual being the determination of the ultimate tensile strength of briquettes of 1 square inch cross-section. Two sorts of briquettes are tested, viz., neat briquettes, which are entirely of cement, and mortar briquettes, made of three parts sand and one part cement.

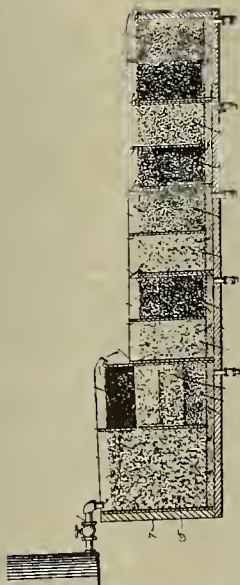
After the briquettes have been made they are placed in water and "pulled" at the end of one, seven and twenty-eight days, five briquettes generally being used at each testing. The test must be made immediately after removing the specimen from the water. A complete record is furnished by the test and retained in case of complaint regarding any lot of cement.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 17, 1903.

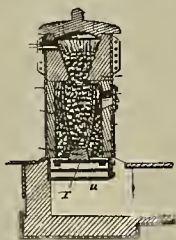
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF SEPARATING PRECIOUS METALS FROM SOLVENT SOLUTIONS.—No. 722,762; J. P. Schuch, Jr.,ripple Creek, Colo.



Process of separating precious metals from solvent solutions, consisting in neutralizing contained acid and free soda or carbonates, subjecting solution to precipitant, then to filtering agent, precipitating zinc held in solution, and subjecting the solution alternately to action of precipitant and filtering agent.

CRUCIBLE SMELTING FURNACE.—No. 722,831; O. Forshach and E. Clerc, Mulheim-on-the-Rhine, Germany.



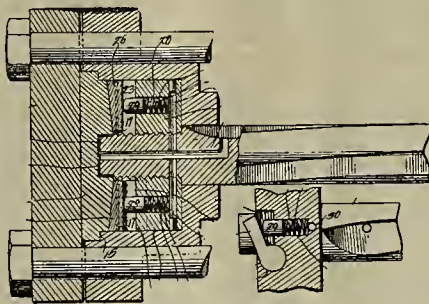
In crucible smelting furnace, crucible supported above grate bars, with receiving portion arranged above crucible and communicating therewith, receiving portion having outlet extending thereinto above material in receiving portion, cover arranged on receiving portion, means for permitting fuel to be fed around crucible, heat rising from fuel entering receiving portion, directly engaging material in receiving portion previous to exhaust through outlet.

METHOD OF TREATING ORES.—No. 722,809; F. R. Carpenter, Denver, Colo.

Process of treating dry siliceous ores containing precious metals, consists in smelting them with sulphur, copper and basic flux, subjecting matte produced to oxidizing roast, resmelting product with siliceous flux, producing black copper containing precious metal and rich slag, adding rich slag to subsequent charge of ore, adding to black copper metallic

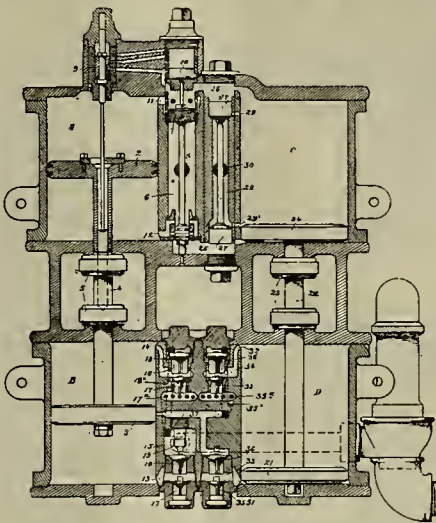
lead, subjecting mixture to heat and oxidizing blast, thereby forming coppery litharge and residue consisting mainly of precious metal, separating the two, smelting coppery litharge with sulphur-bearing material and other reducing agents, producing metallic lead and matte, finally smelting matte, producing metallic copper.

ROCK DRILL.—No. 722,914; V. Schneider, Tri-mount, Mich.



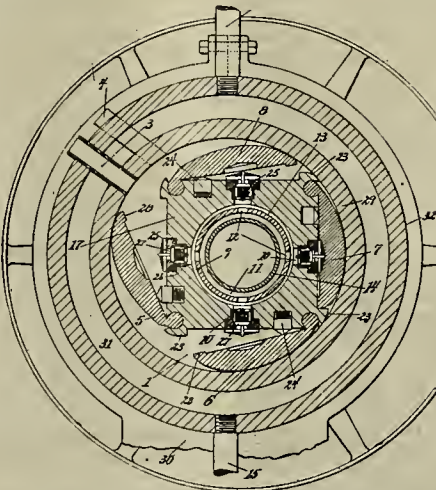
Combination in rock drill rotating mechanism, of rifle bar, cylindrical pawl carrying head secured thereto, provided on rear face with pawl receiving recesses, paws pivotally disposed in recesses, pin receiving openings formed in head at points under paws and in communication with air or steam space of cylinder of drill, pins adapted to openings and serving to hold paws in operative position, and ratchet disk for engagement with paws.

COMPOUND AIR COMPRESSOR.—No. 723,001; G. W. Marsh, Oakland, Cal.



In fluid compressor, main impelling and compressor cylinders with connected pistons moving in unison; and inlet and discharge valves therefor, supplemental impelling and compression cylinders, connected pistons movable therein, and valves whereby exhaust from first impelling cylinder admitted to drive piston in second, and valves through which partially compressed air delivered from second compressor cylinder to first compressor cylinder.

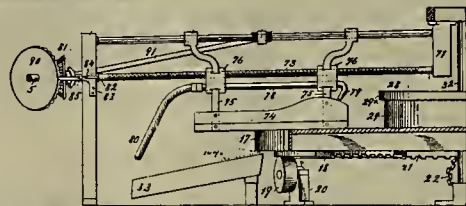
AIR COMPRESSOR.—No. 723,000; M. W. Marsden, Philadelphia, Pa., assignor to F. S. Cohn, Cleveland, Ohio.



Cylindrical casing provided with inlets, shaft fixed in respect to and arranged eccentrically of casing, carrier revolvably mounted on shaft and provided with movable wings or vanes, free ends of which ride on inner face of casing, receiving chamber formed between shaft and carrier, passages arranged under

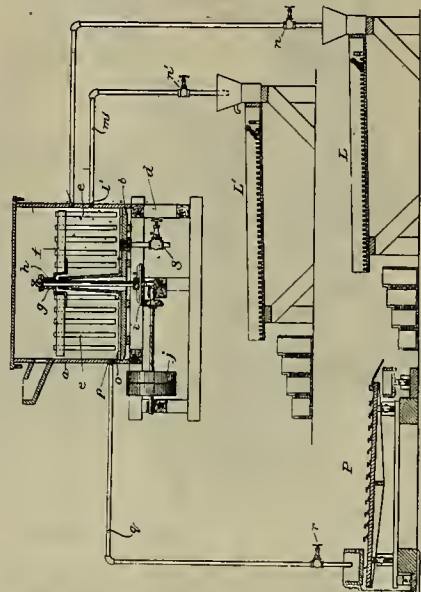
vanes and communicating with chamber and with space included by casing, check valves arranged in passages and adapted to be actuated by wings.

ORE CONCENTRATOR.—No. 722,933; J. B. Arthur, Kansas City, Mo.



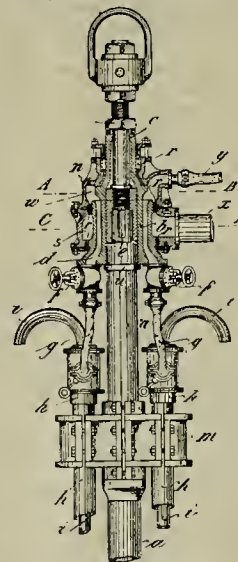
In ore concentrating machine, table, knife or scoop arranged to remove accumulations of ore, mud, etc., upon table, parallel worm and guide rods, frame secured to knife or scoop engaging worm and guide rods, means for rotating worm and causing advance or retrograde movement on part of scoop or knife.

METHOD OF TREATING ORES.—No. 723,212; P. A. Knappe, Grantville, Ga.



Process of treating ores feeding pulp to settler and grading same therein, continuously withdrawing each of lighter strata before contact with mercury, causing mixing contact of heaviest pulp particles with mercury, discharging non-amalgamable portion thereof, and separately recovering values from different grades withdrawn from settler.

PIPE COUPLING FOR DEEP BORING DEVICES.—No. 722,764; T. Steen, Berlin, Germany.



Coupling for flushing pipe and lifting device of boring apparatus formed with two chambers therein, one of which connects with flushing pipe supply, and other with lifting device supply.

PROCESS OF TREATING NICKEL ORES, ETC.—No. 723,159; T. Jenkins, Webster, N. C.

Process treating nickeliferous material, by subjecting material to action of suitable solvent, precipitating nickel from solution as nickel oxalate, reducing nickel oxalate to nickel oxide, adding calcium carbonate to filtrate to precipitate calcium oxalate, and recovering oxalic acid from calcium oxalate.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

Judge Wickersham of the United States District Court, Third Division, Alaska, has removed the office of commissioner from Circle City to Fairbanks, on Pedro creek, the center of the strike on the Tanana river.

Superintendent J. Reagan, operating the Reagan group of lode claims on Sheep creek, near Juneau, reports opening up a 4 foot vein of gold quartz ore.

At No. 2, on Daniel creek, Topkok, near Nome City, J. Berger and J. T. Sullivan have eight men at work and have opened up 25 feet of gravel which carries pay, says the Nome Nugget. A shaft will be sunk to 100 feet, if necessary, to find bedrock. This claim will be hydraulicked the coming season, water from the Topkok Ditch Co.'s system being used.

The Nome Gold Digger quotes the following wholesale prices for supplies at Nome: Potatoes, per crate, \$5; onions, per crate, \$6; eggs, per case, \$19; sugar, per 100 pounds, \$9; hams and bacon, per pound, 25 cents; coal, per ton, \$25; hay, per ton, \$55.

The Nome Nugget says the Kelly pumping plant of the Nome Exploration Co., on the west bank of Nome river, at the mouth of Dexter creek, will be in operation next month. It consists of eight 25 H. P. portable boilers and three compound condensing pumps, but will be enlarged during the summer by the addition of two more pumps and six boilers. From Nome river the water will be pumped through 6-inch mains to four wooden reservoirs of 5000 gallons each (two on north side of King mountain and two across the canyon on north side of Dexter mountain at an elevation of 900 feet). The company will have no water for sale, but will conduct it from the reservoirs through other pipes to the ground they intend working. They will operate this season on Dry, Grass, Newton and Dexter creeks with their largest hydraulic operations on the Sugar claim. The fuel used in the furnaces will be crude oil. A. E. Campbell is superintendent.

According to Nome advices, a strike has been reported on the Shungwak, a tributary of the Kobuck, and there is a stampede on from Candle in the Immachuck country. It is reported all unrepresented property was staked on January 1st. A new discovery has been made on Inglechuck, several miles below Dasley's. From one prospect hole forty pans yielded \$27 of coarse gold.

A quartz ledge 75 feet wide, carrying values in gold, has been found on Norton sound, 50 miles below Chink. A number of men are at work developing the property; a 60-foot shaft has been sunk and a vein crosscut at that depth.

ARIZONA.

COCHISE COUNTY.

The Portage Lake & Bisbee Development Co. has incorporated at Hancock, Mich., to operate a group 3 miles from Bisbee and 1 mile from the Calumet and Pittsburgh group.

At the Calumet & Arizona smelter at Douglas an additional furnace is being erected which will double the output. It is expected to blow it in next week. At present their output of copper is 800 tons per month. There are 100 men on the payroll, which will be increased to 350.

A steam hoisting plant will be installed on the Bisbee Con. Co. group in the Solomon Springs district, south of Bisbee, says Manager R. H. Samuel.

The Bisbee-Arizona C. M. Co. has begun work on its group 7 miles from Bisbee, in Iron Mountain district, adjacent to the Modern mine.

The Cottonwood M. Co. of Dos Cabezas, F. Hellig manager, have resumed. A hoist and pump have been put in.

The work of sinking the new shaft of the Tombstone Con. M. Co. at Tombstone is progressing and is down 110 feet below the water level. The station for the 700-foot level is being cut. The pumps are working steadily, throwing 1,700,000 gallons of water per day. The company has laid a pipe line from this shaft to the Tribute and Lucky Cuss hoists, which they intend to start again. A larger hoisting engine will be put in at the Tribute.

At the Copper Glance mine at Bisbee grading for the machinery is finished and the pump station has been cut at the 500-foot level.

The Bisbee Review says that at the Lowell mine, near Bisbee, the boiler plant is being completed. They have finished their third compartment and have driven the tunnel from the 60-foot landing to the

railroad. A new flat cable has been put on the hoist. They are handling a large volume of water, and will work ballers till their pumps are in place.

GILA COUNTY.

At the Old Dominion mine at Globe the four-compartment shaft is down 40 feet and the temporary gallow-frames in place. Another pump is being put in on the twelfth level of the present working shaft. At the smelter the supply of ore is increasing and the coke and coal bins are filling, says Superintendent Hoar.

P. W. Fleming, secretary of the Gold Mountain M. Co., states that the Golden Wonder mine has produced \$100,000 by arrastras. The property has 2500 feet of development and recently new ore bodies have been discovered.

GRAHAM COUNTY.

P. F. Crowley and A. Burke will begin development work on their Copper Plate group of nine claims on the south side of Coronado mountain, near Metcalf. The Copper Plate lode lies 1/2 mile east of the Coronado lode and is from 25 to 100 feet in width.

MOHAVE COUNTY.

The Argo mine on Sherums peak, near Chloride, is being worked by T. McNeely, the owner. The main tunnel is in ore for some distance, and stoping began this week. The ore is lead carbonate, carrying values in silver and gold.

The Oro Plata mill has been started this week on a trial run.

The P. & A. Co. have their hoist in operation on the Mother lode. The shaft is 75 feet deep with 3 feet of ore in the bottom.

The Homestake group of mines, near Snowball camp, near Kingman, has been bonded to the Gold Roads Co. for \$400,000.

The Ben Doran group of mines are being developed by E. B. Smith, A. and J. Bauman of Fremont, O., members of the Swiss-American M. Co., owning these mines near Kingman. At the depth of 100 feet on the Uncle Sam the vein shows ore and drifts have been run 50 feet each way on the vein. Much of the ore shows free gold. On the Ben Doran a crosscut 200 feet north of the Wilkinson shaft opened up 18 inches of the same ore found in the discovery. It is proposed to install a reduction plant.

Manager L. Hoffman of the Samoa mine, near Chloride, says he has twenty pack animals bringing out four tons of ore per day. They have two parallel veins—the Fourth of March and the Samoa. On the Fourth of March a shaft is down 115 feet and showing in the bottom a 20-inch streak running three ounces in gold, sixty ounces silver and 10% lead. A crosscut will be run 175 feet under the Samoa vein at the Bowman tunnel, in 90 feet, which will tap the vein at a depth of 400 feet. It will be used as a working tunnel.

YAVAPAI COUNTY.

Glenson & Gelge are developing the North Star mine on Lynx creek, near Prescott, and show 5 feet of free milling gold ore assaying \$30. Several of the mine owners of this camp have decided to jointly erect a stamp mill this spring, as there is plenty of ore on the dumps to keep ten stamps dropping for six months, says the Prescott Prospect. Boblet & Bowman are working the Gold Tunnel group. H. Watson, west of the Bonnie, has his shaft down 115 feet.

ARKANSAS.

MARION COUNTY.

The Arkansas Zinc & Lead M. Co. has incorporated at Dodd City; W. H. Sisson, R. Sanderson, M. Mallory, F. Batt.

PULASKI COUNTY.

The Central M. & D. Co., of Little Rock, has been incorporated; H. E. Smith, D. D. Brunson and J. A. Brunson.

CALIFORNIA.

AMADOR COUNTY.

The 40-stamp mill at the Zella mine, near Jackson, resumed last week, after a suspension of several months.

At the Fremont-Gover mine, near Drytown, grading for the 40-stamp mill continues. It is expected the mill will be ready for crushing by July 1.

The Amador Dispatch says J. Macdonald has made a change in the system of management at the Keystone mine at Amador City, of which he is the owner. Instead of having a superintendent at the mine, there are foremen over the mill, the store and mine, each of whom reports direct to the owner at his headquarters in San Francisco.

KERN COUNTY.

Jensen & Hoffman are putting in a whim at the La Crosse mine, near Randsburg, and operations will resume next week. — The Santa Anna is having a

millling at the Red Dog mill. — Atkinson Bros. have put in an electric battery for blasting purposes at the Sunshine mine, near Randsburg.

The premature explosion of a blast in the Sunshine mine, 2 miles from Randsburg, on the 26th inst., buried one miner under tons of rock, caving the mouth of the mine and the portion in which he was at work.

The Union Pacific Oil Co. will begin drilling on the Carisa plains, near Bakersfield, in entirely new oil territory, says the Reporter.

The California Combined Oil Co. report having struck oil north of Bakersfield at a depth of 1020 feet.

Eastern men last week bought forty acres of oil lands at Sunset, adjoining the Pittsburg, Stratton and Sunset Queen, for \$83,000. Development work will begin next week and additional wells sunk. W. B. McIntosh is manager.

MONTEREY COUNTY.

Graham & Kellerman of Los Angeles will begin drilling for oil next week on the De Alvarez ranch, near Bitterwater, San Benito county.

NEVADA COUNTY.

Electric pumps are to be installed in the Brunswick mine, near Grass Valley, says the Tidings-Telegraph. Three of the pumps will have a capacity of 750 gallons a minute.

G. W. Root and J. W. Helsner have been given a bond on the Alta California gravel mine, 3 miles west of Grass Valley. It consists of a claim of 140 acres.

A 10-stamp mill has been installed at the Pine Hill mine at Wolf.

At Grass Valley, Superintendent W. H. Dunlap of the Lecompton M. Co. reports having shipped five carloads of assorted ore to the smelter last week which averaged \$150 per ton.

The 8-stamp mill of the Murchie M. Co., near Nevada City, was destroyed by fire on the 19th inst. The mill plates were saved.

ORANGE COUNTY.

(Special Correspondence).—The Santa Ana Tin M. Co. of Los Angeles, with mines in Trabuco canyon, recently installed a set of Leyner machine drills, a Leyner air compressor and gas engine. A new hoist, recently purchased from Thomson & Boyle of Los Angeles, has been sent to the mines, where it will be installed.

It is reported that the Brea Canyon Oil Co. will install an electric generating plant, to be run with the natural gas from their wells near Fullerton.

PLACER COUNTY.

Superintendent E. J. Kendall of the Three Stars mine, near Auburn, says he has sixty-five men at work. They are running a drift on the 700-foot level to connect the Belmont and Three Stars shafts, a distance of 2100 feet, of which 1200 feet has been run. It will drain the water from the Belmont to the Three Stars, where they have put in a triple-plunger electric pump, which will raise the water 720 feet vertically with one lift. The drift is being run for ventilation as well as drainage. Work is being pushed in all the levels in both shafts, with an output of ninety tons per day.

All work on the Gold Blossom mine, near Auburn, has been suspended and the pumps were pulled from the mine last week.

The Centennial mine on Duncan hill at Ophir is in operation.

At the Dardanelles placer mine, near Forest Hill, operated by an Eastern company, the last storm carried the dam, pipe and flume lines, and other improvements away. They are ground sluicing, however, and taking out good pay.

SACRAMENTO COUNTY.

The Borges ranch, near Negro Hill, near Folsom, has been bonded to the Old Homestead M. Co. for ninety days and it will be prospected to determine its value for dredging.

SAN BERNARDINO COUNTY.

The Gold Peak M. Co. is installing a 5-stamp mill and cyanide plant on the Johnson mine at Victor.

SHASTA COUNTY.

W. T. St. Aubyn is operating the Shafter mine, on the divide between French Gulch and Deadwood. The tunnel is being retimbered.

A new roadway is being cut to connect the Sybil mine, near Shasta, with the county road. Manager Von Kruze says he will move machinery from the Black Diamond, near Gray Rocks, across the river, to the Sybil.

At the Milkmaid mine, owned by Jones et al., the mill and hoist are in operation. This week the Mountain C. Co., at Keswick, made the first shipment of copper since the strike began, the copper going

to the refinery in New Jersey. This shipment was one of the largest in the history of the company.

It is reported at the Aftertought mine, near Bella Vista, preparations are being made to install a 150-ton smelter this spring.

SISKIYOU COUNTY.

(Special Correspondence).—M. J. Whitney & Co. of Detroit, Mich., working the Pine Grove mine by hydraulic elevator, 2 miles above Oak Bar, are getting good pay from bedrock, taking out \$150 in two hours last week.

Daggett Bros. & Co. recently struck a pocket on the Red Cross mine; in a quartz-porphry dike, \$2800 being taken out. They are building an arrastra. The mine is 3 miles above Oak Bar.

The Barkhouse hydraulic mine, owned by Lange Bros., is doing well this season, with an outlook for a prosperous season. Oak Bar, March 20.

Work was resumed last week at the Scott mine on Indian creek, near Etna, after a short shutdown, says Superintendent Scott.

Superintendent Geary of the Tacoma M. Co. has men at work on the Eastlick mine, three-fourths of a mile from Oro Fino. It is intended to sink the shaft 200 feet.

The Cherry Hill mine, near Yreka, is being operated with twenty-five men at work. The main tunnel is in 1600 feet, from which they are drifting both ways.

The McKean mine, above Callahan, took on twenty-five more men last week, making a total of sixty at work.

E. Brokaw of Quartz Valley is making preparations to start up the Golden Eagle quartz mine, on Indian creek, near Fort Jones, and will sink a shaft at least 250 feet.

J. R. Wade, superintendent of the Porter Bar M. Co., near Etna, has sunk the shaft 50 feet and expects to reach bedrock this week, says the Etna Advance. As soon as the bedrock is reached, he will run crosscuts under the river bed.

M. Wacker has men at work on his placer mine on Yreka Flats, at the head of Spring gulch, near Yreka.

TUOLUMNE COUNTY.

The work of retimbering the shaft on the Pennsylvania mine at Cherokee, near Carters, has begun. The shaft is caved from the collar to a depth of 40 feet. When this is repaired the pumps will be started to take out 200 feet of water, says Superintendent C. L. Lang.

Work is resumed at the Mayflower tunnel, near Groveland, after a temporary shutdown for repairs.

At the Cosmopolite mine Superintendent Argall says the shaft will be sunk an additional 200 feet. It is proposed to install a stamp mill this spring.

The Willetta mine at Jacksonville has suspended operations, says Superintendent Stayton.

Superintendent G. A. Whiteford of the Norwegian mine, near Tutletown, says their mill will be enlarged to twenty stamps.

The Ribbon Rock G. M. Co. has deeded to the Yankee Hill G. M. Co. for \$3750 the Polson Oak mine and improvements, near Carters.

The Don Pedro G. M. Co. have bought the Juster quartz mine near Don Pedro Bar, near Chinese.

In the Dutch mine at Quartz they have in drifting on the thirteenth level struck the ore shoot which yielded on the level above.

A. W. Weaver will open up a group of gravel mines on the Stanislaus river north of Confidence.

At the Woodside gravel mine, near Columbia, Estey & Stanford have bought the interests of Woodside Bros. et al.

YUBA COUNTY.

At the O'Brien mine, 9 miles east of Marysville, it is proposed to install a dredger.

COLORADO.

BOULDER COUNTY.

The Wood Mountain mill, near Wall Street, has resumed after a temporary shut down to enlarge the mill.

CLEAR CREEK COUNTY.

Native silver is reported struck in the 9th level of the Corry City mine, near Silver Plume.

Operations have begun on the Collins lode, near Silver Plume, by the Denver Leasing Co., the adit level cleaned out and driving resumed. A winze has been sunk from the adit to a depth of 60 feet and drifting done from the bottom of the winze, opening up ore.

DOLORES COUNTY.

The Atlantic Cable mine of the United Rico M. Co., near Rico, resumed operations last week. The company is enlarging the shaft, and a hoist will be installed and an aerial tramway built from

the mine to the mill, which is on the railway. When the tramway is in operation the tunnel, through which the ore was formerly trammed from the mine to the mill, will be abandoned. The Rico-Aspen Con., owned by the same company, will be reopened the coming summer. The zinc plant will be enlarged.

GILPIN COUNTY.

A Denver company is operating a group of sixteen claims at Nevadaville. The principal work has been done on the King, Lamherson & Warren and Oranoke, and through these the others are opened up. The ore is a lead body carrying gold, with some iron and a little zinc. The King shaft is 600 feet deep, the Lamherson & Warren 220 feet and the Oranoke 250 feet. The veins are 3 to 4 feet wide and the smelting ore runs \$40 gold per ton and the mill ore \$8. A crosscut on the 400-foot level broke into a vein 23 feet wide last week. It is proposed to install a 100-ton concentrator this season. T. Marx, G. W. Kramer, G. B. Dodge, J. W. O'Connor, W. C. Thomas, J. Flischer and E. B. Coe make up the company.

The Golden Rod M. & M. Co., owning and operating the Money Maker, Merry Monarch, Pet, Vindicator, Redemption and Good Luck claims, in Silver Lake district, near Central City, are installing a steam hoisting plant on the Pet claim. The shaft on the Pet is down 75 feet. Chicago, Ill., parties are interested, with J. Lillig president and manager. It is proposed to build a mill next summer.

The Grand Central G. M. Co., owning the East Whiting mine at Central City, has decided to sink its shaft 200 feet deeper, making it 660 feet, and two additional levels will be run. The company is producing fifteen tons a day of smelting grade ore that runs \$80 and milling grade that runs \$7 a ton. H. Demasters, H. H. Barbee et al., of Colorado City, have control.

GUNNISON COUNTY.

(Special Correspondence).—The mine and mill of the Red Rover Co. have closed down indefinitely, all men laid off and a watchman put in charge. This company have an option on a tract of land 1½ mile north of Gunnison, on the Gunnison river, where they expect to erect a smelter of 100 tons daily capacity, and when completed will start up their mine and mill again. They have plenty of iron ore and lime for fluxing within 3 miles of their smelter site.

Gunnison, March 22.

HINSDALE COUNTY.

(Special Correspondence).—Rich silver ore was recently reported found in the Klondyke, on Henson creek, owned by Bardwell, James et al. A streak of talc 4 inches wide on the hanging wall of a vein is filled with native silver, specimens of which assayed 4400 ounces per ton.

The 100-ton concentrator of the Hidden Treasure M. & T. Co., near Henson, has started up after being idle three months on account of lack of water, and is now turning out a lead-silver concentrate of good value. The ore is concentrated about 10 into 1, and, although low in grade, yields a good profit.

The Monte Queen, a short distance from Lake City, on the Lake Fork, principally owned by New York men, is producing some good ore. W. Mendenhall is in charge.

A meeting of the stockholders of the Crystal Lake G. & C. Co. is to be held at Lake City on April 9 to elect directors and to make plans for working the property. This company owns the Hub and Vandalia claims on Hotchkiss mountain, on the same vein as the Black Crook. Some very rich tellurium ore has been found on the Vandalia claim.

The new shaft on the Ute & Ulay is finished and the crosscut started to the vein. They are now in 40 feet and expect to cut the vein at 150 feet from the shaft.

Lake City, March 17.

JEFFERSON COUNTY.

The smelter operating at Golden, under the Clear Creek M. & R. Co., has been shut down and Superintendent A. Carpenter has announced that the suspension will be permanent. This action is due to trouble with labor unions. As a result of this shutdown, several of the mines around Empire and in Clear Creek county have been forced to suspend work, as the ore which comes from them is such as can be treated only at the smelter which was operated in Golden.

LAKE COUNTY.

At Leadville the company driving the Yak tunnel will remodel the Johnny mine cyanide plant, near the Arkansas smelter, into a zinc-lead separating mill. A. R. Meyer is manager, and says the plant will have a capacity of 100 tons daily.

The concentrating mill on the Peerless Maud mine, in Horseshoe district, near Leadville, was started last week, says

Manager H. Dyatt. It has a capacity of sixty tons daily.

The Two Bit G. & C. Co., near Leadville, have sunk their shaft another 65 feet and begun drifting.

President Lapsley will resume operations at the Robinson smelter at Leadville next week.

The Midas M. Co. at Leadville is shipping 150 tons of ore per day. Drifts are being run from the Midas ground to connect with the Coronado, and as soon as retimbering is completed at the latter drifts will be started from that end.

The Carbonate Chronicle says W. Johnston of Denver has leased the Found Out lode, near Leadville.

Superintendent J. H. Henley of the Valley L. & M. Co. is reopening the Valley mine at Leadville, and will sink the shaft (down 300 feet) deeper, following down the ore.

C. R. Oegood and T. Sullivan, lessees on the Sixth Street shaft at Leadville, in opening new ground on the 600-foot level west have found a body of manganese and silver-iron ore. Shipments average fifty tons a day.

MINERAL COUNTY.

The Creede Candle says work will be resumed on the Ridge mine, near Creede, by J. Oetrum, operating under lease.

SAN JUAN COUNTY.

The Continental-American G. M. & M. Co. was incorporated at Denver last week by New York men to operate a group of mines in Corkscrew gulch, 4 miles from Gladstone. About 450 feet of work has been done on two tunnels and a shaft is down 120 feet. Buildings will be erected and machinery placed.

Work was resumed last week on the Sultan tunnel of the North Star group on Sultan mountain, near Silverton. This level is being reopened to cut at depth the Gladstone group of claims under bond to the Silverton M. Co. The Gladstone adjoins the North Star on the east and the Sultan tunnel opens up the North Star vein to within a few feet of Gladstone ground.

The Gladstone mine, on Sultan mountain, near Silverton, is under bond and lease to the Silverton M. Co. for \$25,000. This claim is between the Hercules and Old North Star, of which property it is the extension.

SAN MIGUEL COUNTY.

(Special Correspondence).—What is supposed to be the Argentine vein has been struck in the Black Bear tunnel etc. The values of the vein have not as yet been determined, but samples that have been brought down look good. The crosscut tunnel is being driven ahead. H. H. McLean is superintendent.

Telluride, March 20.

The Caribou-Montgomery group, at Ophir, has been sold to a company of New England men, and the first payment of \$50,000 made by Manager Axtell of Boston. A larger mill will replace the one on the property.

TELLER COUNTY.

An ore shoot has been opened at the depth of 100 feet, south of the shaft on the Hillside claim of the Creede & Cripple Creek Co. on Gold hill, Cripple Creek. The find shows 5 feet of ore averaging \$30 per ton, and is in a north and south vein which forms a junction with the east and west vein near the shaft. Heretofore all the work done there has been in the east and west vein.

The Magnolia mine on Gold hill, Cripple Creek, above the Midland sampler and adjoining the Madeline, is to be developed by New York men who have a lease. Machinery will be installed and work started in the shaft. A dyke cuts through the shaft and it is to be exploited to ascertain if it contains an ore shoot.

In the 30-foot crosscut run from the bottom of the 60-foot shaft on the Des Moines mine, on Raven hill, Cripple Creek, a 2½-foot vein has been opened up, assaying \$8. It is the intention of the lessee to make a shipment next week, and he will sink on the vein as soon as the extent of the ore shoot has been determined at the present depth. The shaft will then be put down 200 feet deeper.

Manager Rice of the Stratton's Cripple Creek M. & D. Co. says pay ore at the depth of 1500 feet has been found in the American Eagle mine on Bull hill, Cripple Creek. This is the greatest depth that ore has been found in the district. The bottom level of the Eagle mine is 1500 feet vertical. Before this ore was found the greatest depth ore was known to come from in the district was from the Blue Bird, at a depth of 1300 feet.

A strike has been made at 600 feet in the Last Stake claim, adjoining the Gold Coin, in Victor, owned by the American Con. Co. The find was made west of the shaft, and the shoot is but 2 inches in width, filled with free gold. The mine is under lease to the Last Stake G. M. & L.

Co. for four years with a flat royalty of 30%, with A. C. Denslow superintendent.

At the Dan Hanley shaft of the Cripple Creek Enterprise G. M. Co., at Cripple Creek, a heavier steam plant of machinery is to be installed, says Manager D. Hanley. The plant will consist of two 80 H. P. boilers, a hoist with a capacity of 1000 feet depth, and an air compressor. The shaft is down 200 feet, at which point the vein and dyke have been opened.

Lessees Lowrey & Middagh made a three-carload shipment of ore last week from their lease on the main workings of the Clara D. claim of the Lexington Co. at Cripple Creek, which averaged \$25 per ton. The lessees have drifted on the vein 35 feet to the south and will start the north drift next week. The lessees propose to put in an air compressor to further develop the ore body.

The Uncle Sam Co. at Cripple Creek, K. MacDermid secretary, is making cyanide tests on the ore which has been opened. On the Alta claim of the company men are at work under lease.

The Cripple Creek Times says there are at present 134 shafts in Cripple Creek district within an area of 6 miles square from which ore is being hoisted. Bull hill has 51, Raven hill 18, Beacon hill 12, Squaw mountain 5, Battle mountain 13, on Womack hill are 3, Tenderfoot has but 1, as no work is in progress on the Hooder, Ironclad hill has 4, Guyot hill 3, Gold hill has 24. From some of these shafts more than one lessee is producing ore. The companies operating here give employment to over 6000 men in and around the mines.

At the meeting of the directors of the Golden Cycle Co. held last week the board decided to buy the Aluminum, Fedora and Lone Star claims, adjoining the Golden Cycle on the west, for \$27,250. On the Aluminum claim a shaft is down 600 feet, with considerable drifting and cross-cutting done.

IDAHO.

BLAINE COUNTY.

The Fourth of July M. & M. Co. has been incorporated to work the Fourth of July group of claims on Hailey hill, near Hailey; M. S. Tustin, B. Cooley, L. Yancey, F. Meyn, B. M. Whisner, W. A. Weston and J. W. Ferguson are the directors.

S. Allen, superintendent of the Della Mountain Co.'s mines near Hailey, says the tunnel is in 1400 feet, with 500 feet additional to drive to tap the vein. Three shifts are driving it by hand, making an average of 100 feet per month.

BOISE COUNTY.

A one-half interest in the Edna group of quartz claims, near Idaho City, has been sold to the California M. Corporation for \$10,000 and full payment made. The sale includes a one-half interest in a sawmill and quartz mill. But little development work has been done on any of the claims outside of the Edna, on which a tunnel has been run 1200 feet, gaining a depth of 340 feet. A raise extends from the tunnel to the surface. The pay shoot has been followed 200 feet, average width of ledge 5 feet. The ore carries silver and \$5 per ton in gold. The 5-stamp mill on the Edna will be replaced next summer by twenty stamps.

CUSTER COUNTY.

Manager J. A. Cizek of the Lost Packer M. Co., operating the Lost Packer mine, near Custer, says he will install a 5-stamp mill next month. The mill will have to be packed a distance of 18 miles. As soon as a road is completed this spring the capacity of the mill will be increased.

IDAHO COUNTY.

Superintendent Jewell has men at work for a Kansas City Co., 4 miles south of Roosevelt, and reports values of \$6 per ton for 30 feet in one crosscut tunnel and a 2-foot streak in another that runs \$75 per ton. It is proposed to build a mill next summer.

LEMHI COUNTY.

Analyses received last week of nickel-cobalt ores found in the Blackbird district, near Salmon, are reported to show the ore to contain 13% of nickel and cobalt (mostly cobalt). Work will be done this year by the parties who have a bond on the Go's mines.

The Kittle Burton Co., operating with fifteen stamps on Indian creek, near Salmon, are shipping \$10,000 in gold per month, and they propose to add fifteen stamps more to their mill.

OWYHEE COUNTY.

The Banner, Ontario and Tip Top groups of mines were sold last week to G. W. Venable of New York for the Tip Top M. Co. of New York. The three groups are west of Silver City, on Florida mountain, and west of the Trade Dollar Co.'s mines. Considerable development work has been done on these properties.

On the Tip Top there is a 300 foot shaft, besides crosscuts and drifts. A 500-foot tunnel crosscuts the Ontario and taps the Tip Top shaft. On the Banner group there are 1500 feet of shaft and tunnel work. D. Farmer is superintendent.

SHOSHONE COUNTY.

It is reported the New Jersey M. Co. will install a 10-stamp mill near Wardner, to be later increased to forty stamps.

ILLINOIS.

JO DAVIES COUNTY.

The concentrating plant of the Grant Reduction Co., near Galena, has begun operations. Air drills have been put in and development work is in progress. A body of zinc ore is being opened up, and miners are at work stripping an ore body which lies close to the surface.

KENTUCKY.

CRITTENDEN COUNTY.

The Keystone M. Co. has incorporated at Sturgis to operate in this county.

Concentrating tables are being put in at the Old Jim mine, near Marion, for saving the fines which have in the past been going into the dumps. Up to this time the zinc ore shipped has been picked or washed in simple contrivances which free the gangue from the ore. A separating plant has been erected at Paducah, McCracken county, where it is proposed to clean ores from this and other districts in the Kentucky-Illinois field. It is proposed to transport the ores by water to Paducah. The car shortage has caused considerable delay in shipments, there being several hundred tons of ore ready.

JEFFERSON COUNTY.

The Crater M. Co., of Louisville, has been incorporated; F. D. Hussey, St. J. Boyle, A. L. Robinson, et al.

MICHIGAN.

HOUGHTON COUNTY.

The rock from the Baltic mine, near Houghton, continues an average yield in mineral of thirty-three pounds per ton. The four heads of stamps at the mill are working steadily; each has a capacity of 400 tons per day, which will be increased to 500 tons. The present milling cost averages 27 cents per ton; but with the additional labor-saving devices to be installed, it is expected to reduce this to 22 cents.

ONTONAGON COUNTY.

The Victoria mine, at Victoria, has decided to use compressed air to work the mine and mill instead of electricity. The dam was finished last autumn; power line from canal to millsite approaching completion; work of sinking new shaft begins next week.

The Adventure mine, near Mass City, is taking silver from the Butler lode; the amount recovered at mill is sufficient to pay for washing; 400 men are working at mine; product is running twenty-three pounds per ton and mineral 80% ingot.

Superintendent Wilcox of the Mass mine, at Mass City, says the output of the mine will be increased, and by the end of the year both heads will be running steadily.

MONTANA.

BEAVERHEAD COUNTY.

C. M. Stolle and G. Eighorn have a lease on the slag dump of the Hecla mine at Glendale, near Dillon, and will begin work as soon as the weather permits. It is intended to thoroughly test the slag dump and jigs will be secured from the concentrator formerly used by the Hecla Con. Co. and part of the slag will be concentrated. The first material used will be the screenings. It is their plan to install a smelter if the developments of the future justify it.

BROADWATER COUNTY.

Manager A. M. Easterly says that last week he received returns from a car of ore shipped from the Hard Cash mine, near Radersburg, which netted \$52 per ton in gold over smelting charges. The ore is sulphide of iron. The mine is worked through a tunnel. Shipments of gold ore have also been made from the Last Chance and other claims in the group owned by Easterly & Co.

CARBON COUNTY.

The entire property of the Clarke Fork Fuel Co., at Geho, was sold at sheriff's sale last week to F. H. Davis of Omaha, Neb., for \$95,000. The mine has been closed for several months under an injunction.

Miners in the employ of the Elbow Creek Coal M. Co., at Joliet, have gone out on a strike because an agreement could not be reached with the company on tonnage and the manner of weighing the coal. The men demand a ton of 2000 pounds,

while the company insists on the long ton of 2240 pounds, as established by law. The custom has been to weigh the coal after it was placed in the car. The men claimed it should be weighed as soon as it came from the mine, as otherwise the men do not get credit for the actual work done.

CASCADE COUNTY.

In order to encourage mining at Nelhart the Great Northern road has announced a reduction in the freight rate on low-grade ores, from that camp to the East Helena smelter, from \$4 per ton to \$2.50 per ton.

FEROCES COUNTY.

The proposed merger of mines in Kendall district, involving the Barnes-King group at Kondall, is off, says Manager Barnes of the Barnes-King, the option having lapsed.

GRANITE COUNTY.

The Gold Reef M. Co. was incorporated last week at Phillipsburg; L. L. Stephens, G. D. Wilson and L. U. Loomis. They have bought the Dawn-Reliance-Blazer group of lode claims, 5 miles from Flint station, near Phillipsburg. Over 300 feet of tunnels and shafts have been driven on the vein and the ore assays \$20 per ton in gold.

LEWIS AND CLARKE COUNTY.

C. Hartman and T. Cooney of Helena have a bond on the Ophir placer claims below Helena, comprising a strip 2½ miles wide.

On the Gold Messenger mine, near Marysville, the tunnel is being driven to cut the lead at a depth of 300 feet. At 100 feet on the strike of the lead are 16 feet of milling ores which carry gold values. The company will erect a 50-stamp mill to take the place of the mill destroyed last fall.

The Montana Marble & Mining Co. of Spokane, Wash., are arranging to put in machinery the coming season for quarrying and dressing the marble for market. The company owns 465 acres 3 miles from Helena. The deposits were opened last season.

MADISON COUNTY.

(Special Correspondence).—C. Logan & Co. have located a vein of black oxide of manganese of fine quality near Rochester. The vein crops 2000 feet in length. Assays have shown the mineral (pyrolusite) to contain 96.67% manganese dioxide. It is located 4 miles from the railroad. Rochester, March 23.

PARK COUNTY.

The Buffalo G. M. Co. of Montana has been incorporated by Buffalo, N. Y., and Montana men, to operate a group of six claims in New World district, at Cooke. Some development has been done, the principal work being a tunnel driven on the Great Eastern 100 feet into Henderson mountain, to strike a vein, which has been crosscut for 6 feet without showing the hanging wall. It is proposed to build a 10-stamp mill on Stillwater creek at the mouth of the Great Eastern tunnel. D. G. Ross is manager.

The Kimberly G. M. Co. has resumed work on the construction of their cyanide plant at Jardine, and it is expected to have the plant in operation by May 10. With its completion work in the mine will resume and the tailings from the 40-stamp mill will be flumed to the cyanide plant.

SILVER BOW COUNTY.

The Speculator mine, at Butte, which has been closed on account of litigation, resumed operations this week with 150 men at work, with Superintendent Wishon in charge. When the mine is in full operation its output is 1000 tons of copper-silver ore per day.

NEVADA.

ELKO COUNTY.

The Nevada State Journal reports oil struck this week in a well being bored a mile and a half from Elko.

On the Fond Treasure and Mahoning mines, near Tuscarora, development work is being done.

ESMERALDA COUNTY.

The South Nevada M. Co. has been incorporated by New York men to operate a group of thirty claims 12 miles from Silver Peak. A mill will be installed and water piped from the White mountains.

LINCOLN COUNTY.

E. F. Freudenthal has a bond on the Victor mine, northwest of the Alps mine, near Pioche.

LYON COUNTY.

The capacity of the Davis-Gignoux cyanide plant at Dayton has been increased to 250 tons per day and they are running on tailings from Silver Hill rock crushed at the Rocky Point mill.

NYE COUNTY.

A new mining district called Atwood

has been organized, 80 miles northwest of Tonopah, says the Journal.

STOREY COUNTY.

Manager J. Ryan says, on Brunswick Lode in the Chollar mine, near Virginia City, No. 1 shaft, 600 level, the south lateral drift was last week cleaned out and timbered 130 feet; total distance from the incline, 1175 feet. Electricians are wiring the mine. Drill hole No. 3 has been sunk 101 feet; total, 1109; bottom in porphyry. Have discontinued sinking, and are removing casing preparatory to starting hole No. 4.

Fishers' mill, in the canyon near Virginia City, is running on custom rock from the Lady Bryan district. The cyanide plant will start next week to work the Sierra Nevada tailings.

The Lizard mine, northeast of the Comstock, near Virginia City, will begin development work this spring. A mill to be run by electricity will be built at the mine.

The total bulk assay value of the ore yield of the Comstock mines for the week ending March 14th was \$10,889.07. Of this the Con. Cal. & Va. produced \$5,275.47; Ophir, \$340; Silver Hill, \$4420.77; Caledonia, \$556.50; Justice, \$237.33.

WASHOE COUNTY.

Work at Willow Glen, above Steamboat, by Superintendent Jackson, will be resumed next month.

The Nevada State Journal says the monthly product of the Nevada-Keystone mine, in Yellow Pine district, near Sandy, is \$40,000. The mine is worked to the depth of 700 feet and has a 30-ton cyanide plant.

NEW MEXICO.

GRANT COUNTY.

The Silver Cell mine, at Pinos Altos, has been sold for \$100,000 to the Shamrock M., M. & S. Co.

SIERRA COUNTY.

Q. Vance, working on the Columbia mine, near Fairview, reports opening up a shoot of silver-copper ore. A mill is being installed at the Silver Monument mine. The Wing mill is being moved from Mineral creek to its new site near Kingsbury camp, on Poverty gulch, and a cyanide plant will be added to it. The Minnehaha mine is being developed by shafts and levels to open up stoping ground pending the completion of the mill. The iron mines of Scales & Scales, near Edwards camp, in the Cuchillo, are being worked. The tunnel of the Confidence mine, 6 miles farther south, owned by the same company, is in several hundred feet and being driven 4 feet a day.

OREGON.

BAKER COUNTY.

Manager T. W. Davidson of an Eastern company which has a bond on the Olympia group, of the Cracker Creek district, near Sumpter, says development work has begun. The Olympia is between Sardine and Big Cracker creeks, and may be opened from either of these drainages. Tunnels have been driven on both, with ore in each, but the principal shoot is on the Sardine side, opening ore that assayed \$39. Four quartz claims and one placer are in the group.

The Connor Creek placers, 17 miles down Snake river from Huntington, are the objects of a small rush to locate claims, says the Spokesman-Review. The Connor Creek Placer M. Co. owns 200 acres of placer ground, and the washings from the Connor Creek M. & M. Co. workings. One giant and bedrock flumes are used. Some quartz locations have been made. The Connor Creek M. & M. Co. will start up the 40-stamp mill again this season.

President Hays of the Beaver M. Co. says a 16-drill air compressor will be put in at the Baisley-Elkhorn mine on Elkhorn mountain near Sumpter. The compressor will not be used to operate power drills for the present, but to pump the mine out, preparatory to resuming development.

One of the crosscuts being driven by the Western Union Co., J. A. Hilliker, manager, near Sumpter, has cut the vein, showing 20 feet of milling quartz. The company is also operating the Monte Cristo group and the Innana (a copper property).

Superintendent Beckwith of the Orleans mine, near Sumpter, says a hoist will be installed to be run by electricity, as water power is not available.

A power plant, hoist and pumps will be installed on the Minersville group, in Minersville district, near Sumpter, says T. J. McWatty, treasurer of the company.

The Highland G. M. Co., N. J. Sorensen manager, have bought the Knapp group of claims, near Sumpter, for \$45,000. The group contains twelve claims, water

rights and a millsite, with an abundance of timber at hand.

The Sumpter Miner says thirty additional stamps are to be put in next month at the North Pole mine, near Sumpter, making a total of sixty stamps.

A compressor will be installed at the Gold Bug, near Sumpter, by April 15, and more men put on development work. The company will erect a 10 stamp mill next summer.

Superintendent R. Addoms of the Alpine mine, in Cable Cove, near Sumpter, says work will be resumed and a mill will be installed this summer.

The Gelsier-Hendryx Investment Co. will put in a hoist, with capacity for 500 feet, and pumps at the Gold Pan mine, near Sumpter.

A 10-stamp mill will be installed at their mine, says Manager A. E. Patterson of the Octo G. M. Co., in the Baisley-Elkhorn mountains, near Baker City.

A considerable flow of water has been struck in the crosscut from the Cracker-Oregon shaft, near Sumpter, on the 100-foot level, requiring the installation of a pump, says Superintendent Watters.

A 10-stamp mill will be erected this summer at the Blue Bird mine, near Sumpter, says Superintendent Thorpe. Four feet of ore has been opened up in vein No. 1, assaying \$35 in gold.

A. H. Huntington will operate a group of placer mines on Gimlet creek, near Whitney, this spring.

GRANT COUNTY.

Drifts on the vein of the Dixie group from the crosscut driven to the vein by Ray & O'Neill, owners, have opened 26 inches of milling quartz and they propose to install a mill. The Dixie group is 5 miles from the Dixie Meadows mine, near Prairie City.

Superintendent Brady of the Belcher mine, near Alamo, is having lumber and other material hauled from Whitney to build a hoist and other buildings. The Belcher is developed by tunnels, the main adit being in 1200 feet. It crossed three shoots of ore, and sinking will begin on one of these. Brady says a mill will be installed.

The Belcher mine, near Alamo, will have a stamp mill this season, says G. W. Daines, president of the Daines G. M. & M. Co., which owns the Belcher and adjoining group.

JOSEPHINE COUNTY.

Manager H. Wood, of the company which has taken up the claims showing jade recently found on Althouse and Indian creeks, near Althouse, says development work will begin next week.

At the Hall group of mines on Grave creek, owned by J. & G. Hall of Grant's Pass, development has uncovered a body of black oxide of manganese in quartz which carries values in gold.

While pipping at the lower end of their placer diggings on Galice creek, near Grants Pass, the St. Helens & Galice Co. recently struck an unexpected channel that is yielding pay. This channel is found to extend for several hundred feet along the creek and to carry values through its whole extent.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Jupiter plant, near Deadwood, resumed last week, says Superintendent Sanders. The mill has 150 tons daily capacity and treats by wet crushing cyanide and amalgamation.

The Columbus Con. G. M. Co. has resumed operations at its cyanide plant on Blacktail gulch, near Central City, after an idleness of several months, pending the addition of tanks. The capacity has been increased to eighty tons a day.

The Titanic M. Co., near Carbonate, expects to resume work by April 15. The shaft will be continued to quartzite and drifting begun.

More vats are to be placed in the cyanide plant of the Dakota M. & M. Co., near Deadwood, as the tankage is not sufficient for the crushing capacity. The annual statement issued by the company shows a net profit of \$1.18 per ton realized on ore averaging \$4.11 a ton, over cost of mining, haulage by railroad for 10 miles, and treatment. Their mineral occurs in the siliceous ores of the Cambrian.

PENNINGTON COUNTY.

The Standard Essence Co. of Maywood, N. J., have contracted for the shipment of thirty tons per month of spodumene from the mines owned by M. Everly, D. Swanzy, et al. The price received is \$12 per ton on board the cars in Keystone.

The Columbia M. & M. Co. are installing a hoist and air compressor at Rockford, says Superintendent L. M. Kearney.

UTAH.

BEAVER COUNTY.

The Milford Metal Mines Investment Co. have opened a 9-foot deposit of tripoli

lite on their Paradox claims at the hot springs, in Granite district, near Milford. At a depth of 25 feet the shaft cut a blanket deposit. After passing through the tripolite the shaft entered a body of iron-bearing material. The company has applied for patents on its two lode claims and millsite.

J. Leyshon, formerly of Silver City, is taking ore out of the Beacon mine in the Star district, near Milford, on which he has a lease.

A. Buchanan and D. McKinnon, who hold a bond on the Old Elephant mine, in the Star district, near Milford, have resumed work on the tunnel, in 360 feet, with 100 feet more to cut the vein at a depth of 190 feet. The vein carries silver-lead ore. Mr. Buchanan has bought the Pine Tree claim, adjoining the Elephant.

The Milford C. M. & S. Co. has been organized at Salt Lake City to develop the Blue Jay group of eleven claims south of the Ben Harrison, near Milford; G. H. Dern, F. Y. Taylor, C. E. Hudson, H. Dinwoodey, E. H. Alris, G. Romney and F. H. Lathrop, who is manager.

BOX ELDER COUNTY.

Manager A. R. Carter of the Pine Canyon mine, Park Valley, says a strike has been made in the tunnel being driven to catch a vein which outcropped on the top of the hill. At 465 feet in the vein was cut, showing good values. The company own a water right and have surveyed a ditch which gives a vertical fall of 300 feet to the millsite, and it is intended to erect a mill next summer.

GRAND COUNTY.

The Grouse Mountain M. Co. have started work on their oldings north of Basin, says W. R. Wheat, manager.

L. W. Dutro, president of the Grand View mines, near Basin, says work is resumed on their tunnel into Horse mountain. They have a vein of hematite ahead of them that will require a crosscut tunnel of 400 feet.

M. G. Fowler, superintendent of the Tornado M. Co., says operations will be resumed next week, a crosscut driven and ore extracted from the old workings, which show free milling gold ore.

IRON COUNTY.

Manager Parker of the Ophir of State-line says heavier machinery will be put in and the mill will be changed to a cyanide plant.

JUAB COUNTY.

A winze is being sunk on a silver-lead body of ore from the 1100 foot level of the Mammoth mine, near Eureka, says Manager S. McIntyre. It is down 35 feet.

The equipment for the new mill of the Four Metals Co., near Fish Springs, in Dugway mining district, is on the ground, says Manager Moats, and construction work begun.

The Tintic Miner says the South Swansea mine at Silver City will resume. C. Wheeler is superintendent.

PIUTE COUNTY.

A company of Chicago men are arranging to drive a tunnel in Revenue gulch, near Marysville, to tap the copper belt ores. Only surface mining has been done heretofore and it is intended to drive the tunnel 4000 feet to tap the mineral belt at a depth of 2000 feet.

SALT LAKE COUNTY.

The Boston Con. M. Co., operating at Bingham, propose to install a smelter at their mines of 500 tons daily capacity, says the Salt Lake Tribune.

Manager Thomas of the Maxfield M. Co., operating in Big Cottonwood canyon, near Alta, says he will increase the power plant by an auxiliary water wheel.

The Old Evergreen M. Co., on the divide between Big and Little Cottonwood canyon, near Alta, report developments in the ledge followed for several hundred feet, have opened on the hanging wall 8 inches of ore which averages 10% copper, with some silver and gold. The tunnel is being driven ahead through the porphyry dyke.

C. J. Hodge, owner of the Last Chance mine and mill at Bingham, says he has arranged to resume work on the Last Chance next week.

The Utah Con., operating at Bingham, which until recently had its headquarters in London, has incorporated under the laws of New Jersey as the Utah Con. Mines Co.

After a month's idleness, due to bad roads preventing delivery of coal, operations were resumed at the St. Joe mine, near Bingham, last week.

SUMMIT COUNTY.

Superintendent C. H. Gitsch of the California mine in Thayne's canyon, near Park City, reports the new shaft down 150 feet and drifting begun on the tunnel level to connect this shaft with the mill. When this is finished sinking will be resumed.

Pending these developments, the holsting plant and the mill are closed down.

The 500-foot level has been reached at the Little Bell mine, near Park City, and Superintendent McDonald has men drifting to open up the vein at this depth, after which it is expected shipments will resume.

SUMMIT COUNTY.

The Avondale M. Co., L. Moore of Cincinnati, O., president, have begun development work on their property adjoining the Nalldriver mine, at Park City.

The Silver Bell mine of Park City, after a shut-down of several months, resumed work last week.

TOOELE COUNTY.

A. C. McKendry of the Montana Con. mine of Ophir gulch, near Ophir, says the drift being run from the shaft on the 200-foot level is in 200 feet and nearing the vein. Machinery will be put in and a change made from hand to power drilling.

The electric power and lighting plant being constructed in Ophir canyon is nearing completion. It will furnish electricity for W. A. Clark's Ophir Hill mine and mill.

At the Honorine mine at Stockton Superintendent Raddatz says the air compressors, with other machinery, are in place, and next week the machines will be operating in the tunnel.

UTAH COUNTY.

The shipping of lime rock from the quarries in Twelve Mile pass in Rush valley, near Lehi, has been hindered lately by bad roads. The Hudson interests in the company have been sold to J. Wing, R. Steele and E. W. Ross. They have put up water tanks at the Rush Valley switch and a set of scales to weigh the wagons. J. Wing has a lease on the group and says besides shipping to the smelters he will ship 1000 tons to the Lehi sugar factory, the rock showing on analysis but 0.12% silica, with the balance lime.

WASHINGTON COUNTY.

A. B. Lewis has taken an option on a group of copper claims west of the Utah & Eastern Co. group near St. George.

WASHINGTON.

FERRY COUNTY.

Machinery has been installed at the Lucille Dreyfus mine, near Republic, and operations resumed. They are crosscutting from the bottom of the winze.

The Pioneer-Miner says Superintendent Newton of the Mineral Hill mines at Danville received orders to close down last week.

OKANOGAN COUNTY.

J. P. Blaine, superintendent of the Opal G. M. & M. Co. on Myers creek, near Chasaw, has men at work on the Ben Harrison group and is continuing development on the Opal. The crosscut is being driven ahead and has 350 feet yet to go to cut the vein. Superintendent Smalley of the Oregon mine has men at work on development.

SNOHOMISH COUNTY.

Ore is being drifted on in the North Star mine, near Silverton, assays returning 30.2 ounces silver, 0.10 ounce gold and 20.4% copper per ton.

A tunnel has been started on the Bitter Creek mine, near Silverton, 60 feet below the upper one. The upper tunnel was run 70 feet in chalcopryite. The object in running this drift is to locate the ore shoot, so that a working tunnel can be driven this summer to place the mine in a position to ship their ores.

STEVENS COUNTY.

Manager J. M. Fish of the Columbia River G. M. Co. says they will install a reduction plant at the mines east of Meyers Falls. There are 2000 feet of development work done, with one shaft 150 feet in depth, sunk on the ledge. From the bottom of this shaft a crosscut of 245 feet was run. This vein shows average assays of \$10.54 in gold.

WYOMING.

UINTA COUNTY.

The Beatrice Oil Co. of Nebraska are drilling at Fossil.

The Idaho-Wyoming has attained a depth of 1300 feet.

Over twenty new rigs will be put in commission in the Spring Valley field during April.

The American Con. Oil Co. are working most of their rigs in the Spring Valley field.

Superintendent J. A. Beverly of the Uintah Oil Co. says he has his rig on the ground and drilling will begin as soon as the snow will permit successful work.

The White Star Oil Syndicate has its well down 600 feet and Manager Moore

expects to get the oil sand with 400 feet more drilling.

FOREIGN.

AFRICA.

GOLD COAST.

P. Tarbut reports development on the mines of the Wassan Co. as follows: Total length of reef proved at the 400-foot level, 1500 feet. The average value of the ore over its entire length is in excess of 24 ounces per ton for a width of 18 to 20 inches. In the 500-foot level, about 200 feet has been driven, the average assay value being 4 oz. 6 dwt. for an average width of 14 inches. The shaft is down to the 600-foot level, and the average value in the shaft from the 400-foot to the 600-foot level was 5 oz. 2 dwt. for an average width of 16 inches. The mill has 3500 tons capacity.

AUSTRALIA.

QUEENSLAND.

Returns for the month of February were as follows:

Mine.	Tons Crushed.	Yield in Ounces.
Charters Towers.....	24,700	36,100
Croydon.....	3,100	3,400
Gympie.....	14,900	14,200
Mount Morgan.....	18,600	10,500
Ravenswood.....	2,100	3,600
Alluvial.....	.....	800
Other fields.....	2,400	2,400
Total.....	.....	71,000

BRITISH COLUMBIA.

It is stated that the Crofton smelter blew in on the 20th inst. There are 30,000 tons of ore on the roast heaps. Ore is being regularly delivered from Quatsino sound and White Horse, and ore bunkers have been built at the end of the wharf.

J. L. Parker, manager of the North Star mine at Klmberry, East Kootenay, says development is progressing and forty men are at work.

From the Arlington mine at Erie, Lessee J. Muffett last week shipped three cars of ore to the smelter, giving net returns of \$3318 80.

At the Copper Farm mine, in the same district, Superintendent G. H. Green has opened up a body of low-grade ore. Over 1000 feet of tunneling has been done, and the vein has been crosscut at a depth of 450 feet, showing it 25 feet wide.

W. Blackmore, consulting engineer for the Ashnola Coal Co. at Princeton, has started diamond drill work. A hole is to be drilled a mile east of the one sunk last season, in which a 10-foot seam of coal was cut, at a depth of 700 feet.

The Trill smelter's operations are confined to one lead stack, the remaining lead stacks and copper furnaces having been closed, owing to the coke shortage. Como coke is being delivered at the plant, and when a sufficient reserve is accumulated the company will blow in its copper furnaces.

On Princess Royal island, at the Homestake group, being worked by W. Howden, M. McMillan, R. W. Nowell and B. J. Cliff, 350 feet of tunnel have been driven on the Homestake lead and 50 feet of tunnel on the Anaconda. The ore is gold quartz, with pyrite, assaying \$20. The owners intend to ship the ore to the nearest smelter, as soon as the snow melts.

The Cariboo Gold Fields Co. will install machinery for development of their mines near Barkerville.

In the Similkameen valley, 26 miles from Penticton, the Challa C. M. & S. Co. propose to install a smelter, says Secretary E. Mirandon of Paterson, N. J.

M. L. Moyer has a working bond for a year on the Horseshoe mine, near Trout lake, and adjoining the Lucky Boy.

The Cariboo Creek Development Syndicate, owning the Mohican mine, near Lardeau, will resume work next week. The tunnel in which an ore body was struck last fall will be continued.

O. J. Johnson, K. Neitzel et al. have incorporated the St. Eugene Mountain Co., to work a group of claims adjoining the St. Eugene at Moyle.

The Wakefield mine, near Slovan City, will start operations next week.

Notwithstanding the Fernie strike and complete shut-down of all the Boundary smelters, mining at Greenwood is not at a standstill, says the Rossland Miner.

The Atlin Claim says on Spruce creek, near Atlin, seventy men are wintering, fifty, at least, of whom are taking out large dumps. The benches and hills consist of a hard conglomerate gravel, extending from 200 to 500 feet on each side of the creek and for 2 miles up the creek, commencing at 130 below discovery. This gravel carries values averaging 3 cents to the pan. No timbering is required and the drifts are being run 15 feet wide.

The Kootenay Placer M. Co., on Perry creek near Fort Steele, have installed a

sawmill to equip the mine with flumes and buildings.

It is the company's intention to resume work at the Splitzee as soon as weather conditions permit, says F. A. Hewer, managing director of the Splitzee Co., at Rossland. It is proposed to construct new headworks at a more central point on the group, the boundaries of which have been enlarged by the addition of the Derby and Nelson No. 2 claims. A compressor plant will also be installed, with a hoist, capacity 500 feet.

Since the problem of concentrating ores of Rossland camp was first considered one of the objections raised was the inadequate water supply, says the Spokane Spokesman-Review. Violin lake is 4½ miles southeast of Rossland, affording a natural reservoir, but its location below the level of the mines led to the impression that its waters could not be used for milling purposes. H. B. Smith, a civil engineer of Rossland, has run levels and ascertained that he could deliver water within 400 feet of the south boundary of the townsite, at which point ores could be delivered by tramway at low cost. The Violin Lake Power & Water Co. has been organized, securing water records for 500 miles' inches from Violin lake, and will build a steel pipe conduit from Violin lake to the city, whereby water to mill 5000 tons per day can be delivered, at a cost on construction account of \$100,000.

Superintendent L. E. Beck of the Eva mine at Camborne, in Lardeau district, says the owners (the Calumet & British Columbia Co.) have authorized the installation of thirty additional stamps to the mill, reports the News-Advertiser. The survey for the tramway, 4200 feet in length, from the millsite to the upper tunnel, being driven, has been made. It is planned to have this tramway in operation by July 1. Two tunnels are being driven, the lower of which will tap the upper workings at a vertical depth of 700 feet. This will be used as the main working tunnel until a tunnel has been driven on the same level as the millsite, which will give a depth of 2500 feet.

C. Wolfe, manager of the Golden Monarch Co., of Spokane, Wash., operating the Foghorn mine at Ymir, reports in the crosscut at 800 feet from the portal a pay-shoot of sulphide ore struck, 18 inches wide. This is believed to be a stringer from the main vein, for which the tunnel is being driven.

The Nickel Plate Co., in Hedley camp, are installing a 40-stamp mill. The tramway will be ready for operation by May 1st, says Manager Munson. A flume will convey water from Twenty Mile creek to the mill. Electric power will be used and the tram will be run partly by electricity and partly by gravity.

BRITISH GUIANA.

The gold entered at the custom house, Georgetown, on Feb. 28, for shipment, amounted to 2657 ounces 8 dwt. 4 grains, valued at \$46,803 96. Export from Jan. 1 to Feb. 10: Gold, 1903, \$72,850.72; 1902, \$162,855.16; diamonds, 1903, 562 carats, value \$4129; 1902, 1147½ carats, value \$14,580; kaolin, 1903, — tons; 1902, 500 tons.

Concerning the diamond industry, the Demerara Chronicle of Feb. 11 says: The British Guiana Diamond Syndicate's boat returned from the Massaruni district on the 30th ult., bringing 505 diamonds, which weigh 77 carats. By comparing the number of stones with their weight, it will be seen that these are fairly large diamonds, and it is stated that there are several which are 1½ carat in weight. They were gathered in a short time. The stones were found in the Massaruni district.

On Feb. 6 J. Menzies of the Massaruni Co., Ltd., deposited at Georgetown diamonds equal to 368½ carats, and 3497 diamonds, weighing 172 carats, were entered at the office of the Department of Mines from the Demerara Diamond Co.'s claims in the Massaruni. Many of the stones were of good size.

CHILE.

There is but one district of importance in Chile which produces gold. This lies 42 miles southeast of Cuevitas, on the Antofagasta Railway. The mines were discovered in 1882 and have been worked since with difficulty, owing to the lack of water. This has to be taken up from the railway and costs \$4 gold a ton. The country rock is rhyolite and the lodes are quartz. The gold is found free, with little or no pyrites, but there is a good deal of carbonate of lead and silicate of copper. The principal mines are the Bolaco, Palmira, Pobre Diablo, Bolaquito, etc. The deepest is the first named—300 feet. The Palmira has a tunnel 600 feet in length along a 3-foot lode which averages one ounce to the ton. The Bolaco has given rich ore in a vein 2 to 3 inches wide which accompanies the lode.

The production is about 100 ounces monthly.

MEXICO.

CHIHUAHUA.

Manager T. H. Oxnam of the Palmarejo mine, west of Chihuahua, shipped last week 3000 pounds of cyanide slimes containing silver and gold valued at \$135,000 gold, from one month's cleanup.

In the Batopilas mines, at Batopilas, a four-ton gasoline locomotive is in operation. It was built in sections of not over 300 pounds each, so as to be packed in.

A new silver camp, called San Blas, is started in the San Blas mountains in the Gallana mining district, 2 miles from Guzman.

A company has been organized in Monterey, N. L., to exploit the El Rosario mine, near Parral. B. Reyes, A. G. Galan, I. M. Zaragoza, E. Ballesteros, J. Maria, G. and J. G. Galan and J. Reyes, directors.

DURANGO.

The Penoles M. Co., of Mapimi, will build a railway from its gold and silver mines to San Pedro del Gallo, to develop its coal fields at that place.

NUEVO LEON.

The Reforma mine, owned by M. Gugenheim Sons, is shipping 150 tons per day to smelter No. 3 at Monterey.

OAXACA.

The Natividad mine, on the line of the Oaxaca and Ejutla Railway, in six days run of its mill last week yielded 15,674 ounces of silver and 489 ounces of gold, which may be taken as an average run, says the Chihuahua Enterprise. The expense for labor during the six days run was \$3000.

Gold is reported found in Tuxtepec on the Gulf slope of Oaxaca.

SONORA.

The International C. & G. M. Co. is working the Pedregal gold mine and the Australia silver mine near Alamos. The vein of the Pedregal is reported 17 feet wide and a shaft down 60 feet has opened up the ore shoot.

The Hidalgo M. Co. has been incorporated under the laws of Arizona, to operate three groups of mines (one copper, a silver-lead property, and the third gold) in northern Sonora. The copper group consists of 80 pertenencias (175 acres) 6 miles west of Nacoziari. A tunnel and three shafts from 70 to 80 feet in depth have been driven in ore that runs 15% copper and \$2.50 in gold.

An El Paso, Texas, report says the Astor and Jumbo mines have been sold to Michigan men for \$50,000 gold, and concentrating machinery will be put in. These mines are silver-lead and undeveloped, near Moctezuma, and 20 miles from the Dos Cabezas mine.

NEW ZEALAND.

The Keep-it-Dark Quartz M. Co., Reefton, report for 1902: Battery yield, 2392 ounces gold, value £9607, and 1409 ounces, value £4210, from tailings treated by cyanide. There are fifty-one men employed by the company, which has claims of 118 acres at Crushington, near Reefton.

The Champion G. M. Co. is operating a bank-and-river claim on the Molyneux river, between the Golden Mile and Golden Gravel companies, 1 mile from the Beaumont Bridge, and has also an area of sluicing ground, to work which water is brought 4½ miles from the Little Beaumont river. — The Earnsclough Gold Dredging Co. has two dredgers operating on two claims on the west bank of the Molyneux river, near Alexandra, and last year took out 4543 ounces gold, value £17,720. They have twenty-three men at work and expended last year £8625.

The Waitaha Gold Mines, Ltd., operating at Kuatunu, in the Hauraki mining district, obtained 1433 ounces gold, value £4118, during the past year, with twenty-two men at work.

The Stafford-Waimea Gold Dredging Co. obtained from last year's dredging 566 ounces of gold, value £2291, expending £2150 to carry on operations. The company has two claims, comprising ninety acres, with the option of purchasing sixteen acres of freehold, along Waimea creek, at Stafford Town, in Westland.

The Cromwell Gold Dredging Co. is working a river claim of thirty-two acres, it being 1 mile in length on the Kawarau river, between the Electric and Junction Electric Companies, last year taking out 2815 ounces of gold, value £10,899.

The gold output of New Zealand mines for February was 16,238 ounces, valued at £50,051, as compared with 41,632 ounces, valued at £161,197, for the corresponding month of 1902. It is expected that March returns will be very large, as it is reported that a large quantity was held for export last month for trade purposes.

TASMANIA.

Mount Lyoli M. & R. Co. returns from January 8 to February 4, inclusive, says the Australian Mining Standard, show a total of 22,958 tons of ore treated, the average assay of the ore being copper 2.13%, silver 2.11 ounces, gold .071 ounce. In addition to the above there have been treated during the same period 3560 tons of purchased ore and metal-bearing fluxes. The converters have produced during the same period 456 tons of blister copper, containing copper 451 tons, silver 45,044 ounces, gold 1616 ounces. From December 11 to January 7, inclusive, a total quantity of 23,212 tons of ore was treated, the average assay of the ore being copper 2.23%, silver 2.05 ounces, gold .069 ounce. In addition to the above there was treated during the same period 3201 tons of purchased ore and metal-bearing fluxes. The converters produced during the same period 507 tons of blister copper, containing copper 500 tons, silver 46,289 ounces, gold 1553 ounces.

At the North Mount Lyoli about 1200 tons a week is the maximum output. At Crotty all work in the shape of construction has been suspended, and at present operations are confined to concentrating and smelting. About 100 men, including some minor officials, have been discharged.

Lake City, Utah, from an examination of mines at De Lamar, Nev.

J. F. ROWELL, manager U. S. Gold Incorporation, at Eldora, Colo., is in the East on company business.

R. H. HERRON, interested in the southern oil fields, is in San Francisco, Cal., from Los Angeles, Cal.

C. W. CONKLING of Tekama, Mex., returned from a trip to Boston, Mass., on mining business last week.

G. E. TAINTER of New York City, who is interested in Western mining properties, is in San Francisco, Cal.

G. W. BOYCE has returned to Chihuahua, Mexico, from a business trip to Boston, Mass., and Bangor, Me.

W. ADAMS has returned to Chihuahua, Mex., from New York, N. Y., where he has been on mining business.

T. B. DILLON has resigned as superintendent of the Montezuma mine, near Nashville, El Dorado county, Cal.

J. BROAN is superintendent of the Tiger G. M. Co. in the Bradshaw mountains, southeast of Prescott, Ariz.

A. B. SIMONSON and J. MACNAUGHTON of the Calumet & Hecla mines, Calumet, Mich., are in Salt Lake City, Utah.

L. M. KEARNEY of the Columbia M. Co. of Rochford, S. D., returned last week from a trip East on mining business.

W. H. HILL is in charge of construction of a 40-stamp mill for the Mojave G. M. Co., 8 miles north of Needles, Cal.

B. MACDONALD, of Spokane, Wash., consulting engineer for Le Roi M. Co., at Rossland, B. C., is in New York City.

PRESIDENT J. D. HAGUE of the North Star mines, Grass Valley, Cal., has returned there from San Francisco, Cal.

W. H. YANKEE, of Denver, Colo., is president of the Idaho-Colorado G. M. Co., Ltd., operating near Pearl, Idaho.

F. A. HEWER, managing director of the Spitzee M. Co., has returned to Rossland, B. C., from an extended trip to England.

R. A. HOLLEY, of Berkeley, Cal., is assayer for the Mammoth G. M. Co., near Lewiston, Mont., vice Anderson, resigned.

C. M. WARD, owner of the Starlight and Riverside mines at Grub Gulch, Madera county, Cal., is in San Francisco, Cal.

W. C. GREENE, president of the Greene Con. C. Co., has returned to La Cananea, Sonora, Mexico, from a trip through California.

J. P. GORDON is superintendent of the Montezuma mine, near Nashville, El Dorado county, Cal., vice T. B. Dillon, resigned.

M. G. FOWLER, superintendent of the Tornado M. Co., near Basin, La Sal mountains, Utah, has returned from Chicago, Ill.

SUPERINTENDENT E. R. ABADIE of the Champion M. Co. at Nevada City, Cal., is in San Francisco, Cal., on a business trip.

F. E. WILSON, manager Friday mines and mill, near Baker City, Or., has returned to Salt Lake City, Utah, from Baker City.

H. L. CARVER of San Francisco, Cal., has gone to the drift mine of which he is manager near Sheep Ranch, Calaveras county, Cal.

W. C. ALEXANDER of the Diamond Con. M. Co. has returned to Lafayette, Ind., from an examination of their properties at Stockton, Utah.

J. P. OWEN, manager of the Sierrita M. & M. Co., operating in Pima and Santa Cruz counties, Ariz., is in New York City on mining business.

R. DE LARGE has completed a 10-stamp mill for the Cumberland M. Co. at Dewey, Ariz., and will begin the development of the Omega mines, near Goodwin, Ariz.

SUPERINTENDENT E. A. STENT of the Dolores mine and G. H. Beveridge, one of the owners, returned last week to Chihuahua, Mex., from Mexico City, Mex.

B. P. HOWELLS, superintendent of the Dalton mine at Marysville, Utah, has gone to Virginia City, Nev., to recuperate, having been in ill health for some time.

C. F. HUMPHREY and B. GOODWIN, directors of the Mt. Jefferson G. M. Co., have returned to San Francisco from a visit to their mines near Groveland, Cal.

J. F. PARKES, superintendent Kennedy mine, Jackson, Amador county, Cal., is at Palm Springs, Riverside county, Cal., but will go to Phoenix, Ariz., for his health.

H. G. STOKES has left the Silver Spur mine, Texas, and has been appointed gen-

eral manager of the Glassford Creek Copper M. Co., Ltd., Gladstone, Queensland.

J. B. HASTINGS, former manager of the War Eagle mine at Rossland, B. C., has returned to New York City from an examination of mining interests in Idaho.

G. H. ROBINSON, manager of the Tintic M. & D. Co., returned to Salt Lake City, Utah, last week from Butte, Mont., and has gone to New York on company business.

E. H. BLAKE of Brocton, Mass., president of the Fanny Marie M. Co., returned East this week after a visit of inspection to the company's mines at Mokelumne Hill, Cal.

N. TREWEEK, who for years was foreman of the Homestake mine at Lead, S. D., has been appointed superintendent of the Hidden Fortune mines, near Central City, S. D.

E. B. SMITH, A. AND J. BAUMAN, of Fremont, O., members of the Swiss-American M. Co., have returned to Fremont, O., from a visit to their mines near Kingman, Ariz.

O. B. STEEN of Tombstone, Arizona, president, and A. F. Barnett of San Francisco, Cal., vice-president of a company operating placers near Altar, Sonora, Mex., are at their mines.

G. C. ASCHBACH of Allentown, Pa., treasurer of the Colorado & Northern G. M. Co., with S. H. Roseberry of New Haven, Conn., a stockholder of the same company, are visiting their mines at Wall Street, Colo.

EUGENE COSTE of Rossland, B. C., engineer of the Provincial Natural Gas & Fuel Co., has been elected president of the Canadian Mining Institute, and E. B. Kirby of Rossland, J. H. Tonkin of Ferrie and S. F. Harris of Eholt were elected to the council. It was decided to hold the next annual meeting in Toronto, Canada.

S. S. GLIDDEN, a pioneer miner of the Cœur d'Alenes, Idaho, died at Los Angeles, Cal., on the 17th inst. He was in his 71st year.

N. S. KELLOGG, one of the discoverers of the Bunker Hill & Sullivan mine at Wardner, Idaho, died at his home in Kellogg, Shoshone county, Idaho, on the 17th inst., aged 71 years.

FRANKLIN BALLOU, a pioneer smelterman of Colorado, former vice-president and general manager of the Bimetallie Smelter Co., died on the 20th inst. at Palm Beach, Fla., of pneumonia. Deceased was 56 years of age and leaves a widow, one daughter and two sons.

H. B. SMITH, underground superintendent of the Commonwealth mine at Pearce, Ariz., was killed on the 24th inst. While mounting the ladder 200 feet from the bottom of the shaft, a short distance above which timbers had been placed across the shaft to keep the car from going below that level, the car was ascending with a load of ore and the cable broke, the car and contents crashing through the timbers and hurling Mr. Smith to the bottom.

Commercial Paragraphs.

THE C. H. BESLY Co. of Chicago, Ill., will move into their new building on Clinton St., between Randolph and Washington Sts., about April 15.

PAWLING & HARNISCHFEGGER, crane and hoist builders, Milwaukee, Wis., expect to move from their present location on Clinton, Oregon, Barclay and So. Water Sts. to a new site just purchased on National and 38th Aves.

W. B. ROBERTS, assayer and chemist, formerly with the Phillips Ore Testing Works of Denver, Colo., has secured the assaying establishment of Jas. A. Shedd, at 105 E. 1st St., Los Angeles, Cal., and will pay particular attention to cyanide, concentration and amalgamation tests.

THE Westinghouse Co. will erect a new foundry 320x55 feet wide, to be constructed of brick with steel frame. This foundry will be located west of the present air brake works at Wilmerding, Pa., and has been made necessary by the greatly increased demand for castings used in the apparatus manufactured by this company. This addition to the plant will increase the company's working force, now numbering 3000 men.

Books Received.

"How to Become a Competent Motorman," is a practical treatise on the proper method of operating a street railway motor car. The authors, V. B. Livermore, chief constructor of the Brooklyn Rapid Transit Railroad, and J. Williams, shop foreman of the same company, have given motormen in this little volume information which every motorman should have and which is also of interest to all who ride on electric cars; 232 pages, with numerous illustrations. D. Van Nostrand Co., New York. Price \$1.

"Chemical Technology, or Chemistry in Its Application to Arts and Manufactures," is the title of Vol. IV of a series of books on lighting, edited by W. J. Dibble, with "Electric Lighting" by A. G. Cooke. The volume also includes Richardson & Watts' "Chemical Technology." It is a work especially valuable to specialists in electrical industry who may wish for a resume of all the various systems, machinery, lamps, etc., in use for the supply of electric lighting. The work may be read with facility by any one who has an elementary knowledge of electricity. The section relating to photometry has been carefully compiled with a view to the full description of existing and proposed standard methods of determining the visual intensity of artificial illumination. 378 pages, 181 illustrations. Price \$3.50 net. P. Blakiston's Son & Co., 1012 Walnut street, Philadelphia, Pa.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MARCH 17, 1903.

723,191.—WOMEN'S SKIRT—Augusta Adler, Tacoma, Wash.
723,193.—HAT HOOK—H. R. Bernard, S. F.
723,128.—HOISTING CRANE—W. E. Boden, Pasadena, Cal.
723,805.—SHARPENER—Buckley & Brown, S. F.
723,952.—TRUCK—G. W. Davis, Vacaville, Cal.
723,830.—TREAD POWER—W. De Graw, Clovis, Cal.
723,840.—RECORD FOR HORSES—D. W. Donnelly, Burlingame, Cal.
723,967.—PIANO—A. G. Gardner, Los Angeles, Cal.
723,837.—AIR BRAKE—F. L. Guillemet, S. F.
723,840.—PRUNE PRICKER—J. H. Hammer, Medford, Or.
723,703.—WATER HEATER—Haug & Brown, S. F.
723,614.—MASSAGE APPARATUS—W. F. Hedstrom, Los Angeles, Cal.
723,155.—STUMP PULLER—C. G. Hoffmann, Needy, Or.
723,192.—ROTATING BOAT—A. Kitterman, Portland, Or.
723,720.—CONVEYER—F. H. Lamb, Hoquiam, Wash.
723,721.—CABLEWAY—F. H. Lamb, Hoquiam, Wash.
723,806.—OIL BURNER—H. Luckenbach, Seattle, Wash.
723,101.—AIR COMPRESSOR—G. W. Marsh, Oakland, Cal.
723,010.—OIL BURNER—McLean & Picard, S. F.
723,867.—HOISTS—G. Mitchell, Naco, Ariz.
723,868.—TRAVELING CRANE—G. Mitchell, Naco, Ariz.
723,876.—GAS REGULATOR—C. L. Nelson, Seattle, Wash.
723,897.—BROILER—F. Rademacher, Los Angeles, Cal.
723,899.—TOOL HANDLE—C. V. B. Reeder, San Jose, Cal.
723,619.—THRESHER—J. J. Skinner, Paso Robles, Cal.
723,762.—CALENDAR SUPPORT—F. H. Smith, S. F.
723,946.—LOCK—S. Storm, Los Angeles, Cal.
723,220.—PISTON PACKING—E. W. Tucker, S. F.
723,082.—SCREW—I. S. Turner, Centralia, Wash.
723,890.—BRAKE—E. Wade, Los Angeles, Cal.
723,083.—RECORDING SHOES—N. S. Wakefield, Los Angeles, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

BITS FOR HORSES—No. 722,682. March 17, 1903. D. W. Donnelly, Burlingame, Cal. The object of this invention is to provide a bit and means for guiding horses which can be securely fixed in the mouth of the horse without the necessity of headstall or other disfiguring straps, and to provide a structure of sufficient rigidity to give the rider the necessary leverage upon the mouth of the horse to enable him to control the animal. It is especially designed for riding, but may be used for driving horses. The device consists of a suitably shaped piece of metal, of curved, oval or other form in cross-section, and of such dimensions that the upper portion will extend across from side to side of the mouth of a horse, and from the end of this portion it curves around beneath the lower jaw of the horse.

COMPOUND AIR COMPRESSOR.—No. 724,001. March 17, 1903. G. W. Marsh, Oakland, Cal. This invention consists, essentially, in the combination with high-pressure motor and air cylinders arranged in line, pistons reciprocable therein and movable in unison, and means for supplying fluid to said motor-cylinder, of supplemental or low-pressure motor and air cylinders, pistons movable in unison in said cylinders, connections between the high-pressure and low-pressure motor cylinders whereby the exhaust from the first is utilized as a motive power to drive the piston in the second; inlet ports in each of said air cylinders and connections between said cylinders whereby the exhaust from the low-pressure air cylinder is delivered into the high-pressure air cylinder and the amount of air in the latter increased by the amount of air thereby delivered, so that the act of compression by the piston of the cylinder so

PERSONAL.

S. MARTIN, of St. Paul, Minn., is in Reno, Nev.

F. MCGURRIN of Salt Lake City, Utah, is in the East.

G. STANDART, of Plumas, Cal., is in San Francisco, Cal.

S. BAMBERGER of Salt Lake City, Utah, is at De Lamar, Nev.

A. T. EGAN of Salt Lake City, Utah, is in Mexico City, Mexico.

J. E. BAMBERGER of Salt Lake City, Utah, is in De Lamar, Nev.

W. LAWRENCE has returned to Salt Lake City, Utah, from a trip East.

W. I. HUPP, of Folsom, Cal., is in San Francisco, Cal., on mining business.

W. O'NEAL of Wells, Nev., is in Salt Lake City, Utah, on mining business.

J. H. HENLEY is superintendent of the Valley L. & M. Co. at Leadville, Colo.

M. L. EFFINGER of Salt Lake City, Utah, has gone East on mining business.

W. ATWOOD, a mine owner of Mokelumne Hill, Cal., is in San Francisco, Cal.

G. A. LAND of Salt Lake City, Utah, is at Butler, Nev., examining mining interests.

E. M. DOUGLASS of Salt Lake City, Utah, is in Cincinnati, O., on mining business.

D. L. KILLEN, president Killen-Warner-Stewart Co. of Sumpter, Or., is in New York.

DANA HARMON has returned to San Francisco, Cal., from an inspection of mines.

B. HAUG is superintendent Dewey mine, near Roosevelt, in Thunder Mountain district, Idaho.

J. K. MCKENZIE, E. M., of Chicago, Ill., is in Shasta county, Cal., making mine examinations.

J. H. MCKENZIE, formerly manager of Le Roi mine, Rossland, B. C., is in San Francisco, Cal.

WOODSON GARRARD is in San Francisco, Cal., from his mines in Cochise county, Arizona.

T. J. MCWATTY, treasurer Minersville M. Co., has returned to Sumpter, Or., from Chicago, Ill.

J. M. WRIGHT, president of the Peerless Oil Co., is in Bakersfield, Cal., from San Francisco, Cal.

C. H. LAIDLAW of Fairview, N. M., owner Black Knife mines, is in the East on mining business.

J. V. N. DORR, has returned to Deadwood, S. D., from a visit to Chicago, Ill., on mining business.

J. A. MUDD, of the U. S. Geological Survey, is in San Francisco, Cal., from Washington, D. C.

J. S. PARKER, manager North Star mine, near Fort Steele, B. C., is vice-president Dundee M. Co.

J. W. TAYLOR of Salt Lake City, Utah, manager of the Ima mine, has returned from a short trip East.

R. CAMERON returned last week to Salt

charged will deliver a proportionately greater quantity of air to the reservoir on each reciprocation of said piston. This invention is designed for use particularly on locomotives, and its object is to afford a means of increasing the capacity of the compressor by which the reservoirs supplying the air brakes are charged.

HYDROCARBON BURNER.—No. 723,010. March 17, 1903. A. D. McLean and C. H. Picard, San Francisco, Cal. This invention consists of an oil burner with a conductor and head portion having a transverse segmentally raised section at its outer end and a slot or channel made transversely of said section, a plate having a corresponding curvature at its outer periphery, and plate fixed in the slot so as to separate the oil and steam passages, and forming a separate slot or passage up each side of it, an oil conducting passage through which the hydrocarbon is delivered to the slot in the plate, and one or more independent passages through which steam is directed to impinge against the sides of the plate, to divert the steam and heat the oil passage, and to be afterward discharged through the slots upon each side of the plate.

Latest Market Reports.

SAN FRANCISCO, March 27, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22½d (standard ounce, 925 fine); New York, bar silver, 48½c, refined (1000 fine); San Francisco, 48½c; Mexican dollars, 38 @39c San Francisco, 38½c New York.

COPPER.—New York: Standard, \$13.75; Lake, 1 to 3 casks, \$14.50@15.00; Electrolytic, 1 to 3 casks, \$14.75@15.00; Casting, 1 to 3 casks, \$14.25 @ 15.00; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £63 15s spot per ton.

LEAD.—New York, \$4.67½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £13 5s per long ton = 2.75c per lb.

SPELTER.—New York, \$5.65; St. Louis, \$4.60; London, £22 15s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$29.80@30.10; San Francisco, ton lots, 32c; 500 lbs., 32½c; 200 lbs., 32½c; less, 33c; bar tin, 35c @37½c. London, £136 12s 6d spot.

PLATINUM.—San Francisco, crude, \$18.00 @ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @ flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 21c; San Francisco, Plumbers', 100-lb. lots, 17.65c.

NICKEL.—New York, 50@60c @ lb.; ton lots, 45@48c.

STRUCTURAL METALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$24.00@24.50
Foundry Northern 1.....	23.00@24.00
Northern 2.....	22.50@23.50
Northern 3.....	22.00@23.00
Southern 1.....	23.35@23.85
Southern 2.....	22.85@23.35
Southern 3.....	22.35@22.85
Forge.....	21.85@22.35
Charcoal.....	26.00@27.00
Billets, Bessemer.....	33.00@34.00
Bars, iron.....	1.85@ 1.90
Bars, steel.....	1.75@ 1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, boiler.....	1.90@ 2.00
Tank.....	1.75@ 1.80
Sheets, 26 store.....	2.80@ 2.90
No. 27.....	2.90@ 3.00
No. 28.....	3.00@ 3.10
Angles.....	1.75@ —
Beams.....	1.75@ —
Tees.....	1.80@ —
Zees.....	1.75@ —
Channels.....	1.75@ —
Steel melting scrap.....	18.00@18.50
No. 1 railroad wrought.....	18.50@19.00
No. 1 cast, net ton.....	18.00@18.50
Iron rails.....	24.00@25.00
Car wheels.....	23.00@23.50
Cast borings.....	10.25@10.50
Turnings.....	14.25@14.50

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d,

Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1½, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2 75; Hewmore, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2 75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallend, \$6.50; Brymbo, \$7.50; Pennsylvania, h.d., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 22½c; Bocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50@55c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c @ lb.; carloads, 24@24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½@3c @ lb.; caustic soda, in drums, 3@4c @ lb.; Cal. s. soda, bbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chloride of potash, 12@13c; nitrate of potash, bbls., 8c; caustic potash, 10c in 40-lb tins; borax concentrated, 7@8c @ lb.; roll sulphur, 4@6c; powdered sulphur, 2@3c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2 @ 2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5@7c; chloride of lime, spot, \$3.00@4.00; sulphuric acid, in carboys, 66% B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ¾c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ¾c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ lb.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5@7c.

MANGANESE.—(90% and over) @ oz., \$1.25.

MOLYBDENUM.—25c. @ gramme; 1000 grammes—2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, @ lb., \$1.25.

MERCURY.—Bichloride, @ lb., 90c.

PHOSPHORUS.—(American) @ lb., \$1.00.

SILVER.—Chloride, @ oz., 90c@1.00; nitrate, 55c.

URANIUM.—Oxide, @ lb., \$3.50.

ZINC.—Metallic, chemically pure, @ lb., 50c; dust, @ lb., 10c; sulphate, @ lb., 04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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ASSAYER, CHEMIST AND MILLMAN (concentrator and amalgamating), thoroughly up to date in each branch, desires position. Best of references furnished of a 20-years' experience. Address Box 125, care Mining and Scientific Press, 606 Mack Block, Denver, Colo.

COMPETENT BOOKKEEPER, TYPEWRITER and general office man desires position with mining or smelting company. Can furnish best of references. Address Box 25, Mining and Scientific Press office.

COMPETENT MILLMAN, MACHINIST AND Chemist. Experience free mill and concentrating. College education. Have built and operated mills in Montana for 12 years. Competent accountant and able to administer affairs of a company. Would like situation with a company out of a promoter's hands. References the best. Address H., care this office.

MILLMAN, PRACTICAL, WITH 20 YEARS' experience, wants a situation. Concentration, amalgamation, cyaniding and assaying. Best of references. Arizona or New Mexico preferred. Address "Millman," 1056 South Gaylord Street, Denver, Colorado.

WANTED, SITUATION AS ASSAYER—MINE, mill or smelter. Mexico preferred. At liberty May 1st. Am also an engineer and draughtsman. Can furnish best of references. Address E. C., this office.

WANTED, POSITION AS SUPERINTENDENT of mill. Have had six years' experience in cyaniding in all the details of the practice, including designing, building and operating plants. Wet crushing in cyanide solutions and slimes treatment a specialty. Can superintend mine if desired. Will go anywhere. Address "Milton," care of Mining and Scientific Press.

YOUNG MINING ENGINEER OF SOME PRACTICAL experience desires position as assistant. Good surveyor, assayer and draughtsman. Best of references as to character and ability. Will go anywhere. Address E. D. C., care of this office.

RAILROAD SURVEYS. Applications for positions of Transient and Topographers will be received by the undersigned up to April 1st. None but experienced men need apply. The Company furnishes its own instruments and equipment. Address Chief Engineer Oregon & Pacific R. R., Room 29, 2nd floor, Mills Building, San Francisco.

I will give one-half interest in two mining claims or one-half interest in ten claims for \$100 each, to do assessment work in this great camp.

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MINING AND SCIENTIFIC PRESS

Whole No. 2228.—VOLUME LXXXVI.
Number 14.

SAN FRANCISCO, CAL., SATURDAY, APRIL 4, 1903.

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The Valuation of Mines.

Mine sampling, whether in the daily routine of working a mine, or where conducted for some specific purpose, such as placing a valuation on the property, requires, and should receive careful, methodical, painstaking attention. Reliable results cannot be obtained if the work is done carelessly, or in a haphazard fashion. The ore stands exposed in the mine. It is the business of the person sampling the exposed ore faces to take his samples in such a manner that they will represent as nearly as possible the vein at each place that a sample is taken. If such a sample is not obtainable in small quantity it should be taken in large amount. Any sample that does not represent the vein, or portion of the vein from which it was taken, is valueless. A great deal has lately been written about mine sampling and mine valuation, and some very good ideas have been advanced on the subject by various writers. The work should be done honestly and as thoroughly as possible, and the more completely the task is done the greater value the result will have.

That a scientifically educated mining engineer is the only person competent to sample mines is a mistaken idea, for there are many practical miners who have not had the advantages of technical education who can do this class of work as well as any one else, having been trained in that particular branch.

Preliminary samples to determine where the good and poor places are located in a mine are unnecessary, and are likely to bias the judgment of the person taking the samples. Nothing short of absolute systematization, methodical work will accomplish the desired result. If there are poor places the sample map will indicate where they are, and in like manner the rich spots will give an account of themselves.

The sample map should consist of a drawing showing all the workings in the mine, and on it should be marked the point at which each sample was taken. This should be indicated by a running number. The width of the vein sampled at each place should also be marked on the map. The values, as subsequently determined, may be placed on the map, or they may be entered in a book provided for the purpose, together with its proper number. The more simple the report the more will it be appreciated by those for whom it is intended. It is a good idea to place the values on the sample map, as the relations which the several samples bear to each other then

become more apparent and valuable conclusions may be deduced therefrom.

The sampling of a mine is a task which is purely mechanical, requiring only practical ability to properly take the samples, with the exercise of common sense in the selection of the system or method pursued in the work.

Assaying the samples and making qualitative and quantitative analyses, amalgamation, chloridizing or cyanide tests, belongs to a separate branch of the business, though the man who takes the sample may be thoroughly competent to perform this work as well. Placing the gross valuation on the mine by the results obtained from the samples cannot be safely attempted by an inspection of the sample map alone, except in so far as it concerns "ore in sight"—that is, ore exposed at reasonable distances, on four sides. The possible ore is a factor which should not be given too great consideration unless the sample map be accompanied by a complete report, made by an engineer who is known to be competent to make it. Fixing a probable valuation on the future possibilities of the mine is a delicate and responsible task, which should be submitted only to one known to have had a sufficiently varied experience to render his judgment valuable, if not infallible, for the latter he can never hope to become. A thorough acquaintance with mineral veins and deposits generally, and particularly of veins or deposits similar to the one under consideration, is indispensable to this branch of the business of mine examination, and when it is considered that no two mines are exactly alike, only similar at best, the responsibility attaching to this estimate of value should be appreciated.

Having arrived at the absolute and probable gross



El Paso Shaft, Cripple Creek, Colo.

value, the next thing to determine is the net value. The cost of operating the mine, which includes further development and equipment, and the actual extraction of ore, timbering, reducing the ore and obtaining the hullion, are matters which can only be determined by an experienced mine operator. It may be possible to find in a single person one competent to undertake and successfully carry out each of the several branches of mine examination as above indicated, but it usually requires the experience and mature judgment of several persons, who make a specialty of each branch. Graphic diagrams employed in making mining reports should be of the simplest form. Complex diagrams, which may be perfectly intelligible to the engineer, are not always equally so to the non-technical reader.

The El Paso Mine.

In the Cripple Creek, Colo., district there are now 134 producing shafts within an area of 6 miles square, a condition not at present duplicated in any other district in the world. Among these the El Paso shaft is at present attracting more attention than usual, because the drainage tunnel now being driven to make deeper working feasible and less expensive is being partly accomplished by means of headings driven from this shaft. The accompanying illustration shows the head frame of modern design, having two dumping stations. It also gives a general idea of the other extensive surface improvements. The El Paso is one of the most important mines in the Cripple Creek district, and is one of the few mines actively working at present, owing to labor troubles arising over the strike of millmen at Colorado City.

The El Paso has a new three-compartment shaft which is down 600 feet. It is stated that it cost \$45 per foot. The ore bins have a capacity of 2000 tons, and ore washing machinery for automatically cleaning the clayey ores as they come from the mine has been provided. The air compressor will operate twenty-four drills. The output of the El Paso mine the past year has been about \$40,000 per month. It is expected that the completion of the drainage tunnel will effect a saving to this property alone approximating \$25,000. The tunnel will run for about 700 feet through El Paso ground, serving thereby a double purpose. S. S. Bernard is general manager. The original holding of this company was comparatively small, but by several acquisitions the property now embraces seventy-four acres, the latest purchase being that of the North Star property.



Open Cut Lucy Mine, Cambrian Quartzite, Near Lead, South Dakota. (See page 212.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page
El Paso Shaft, Cripple Creek, Colo.....	209
Open Cut Lucy Mine, Cambrian Quartzite, Near Lead, S. D.....	209
Gravity Aerial Tramway, Ratcliff Mine, Cal.....	213
Mill and Camp, Ratcliff Mine, Cal.....	213
Adit Tunnel, Ratcliff Mine, Cal.....	213
Slimes Plant at Confidence Mine, Tuolumne County, Cal.....	215
Method of Setting the Adams' Hydraulic Lift.....	216
New Portable Cylinder Boring Bar.....	217
Mietz & Weiss Kerosene Engine.....	217
Mining and Metallurgical Patents.....	218
EDITORIAL:	
The Valuation of Mines.....	209
The El Paso Mine.....	209
Life of the Anthracite Mines.....	210
Profits in Copper Mining.....	210
Arbitration in Labor Troubles.....	210
War Tax in the Transvaal.....	210
The Life of a Mine.....	210
Tin Mining in Cornwall, England.....	210
MINING SUMMARY.....	219-220-221-222-223
LATEST MARKET REPORTS.....	224
MISCELLANEOUS:	
Concentrates.....	211
The Elimination of Arsenic, Antimony, Lead and Zinc From Copper Mattes.....	212
Method of Obtaining Daily Samples in Mines.....	212
Mineral Wealth of Utah Districts.....	212
Sulphur a Non-Metallic Mineral.....	213
Fall of Barometer.....	213
The Ratcliff Mine.....	213
Copper Mining in Upper Michigan.....	214
Modern Slimes Plant.....	215
Hydraulic Mining Under Artificial Pressure.....	216
Gold Reported in South Australia.....	216
The Permananate Process.....	216
Tailings at Ely, Nevada.....	216
The Chemistry of Ore Deposition.....	217
The Mietz & Weiss Kerosene Engine.....	217
New Portable Cylinder Boring Bar.....	217
A New Copper District.....	217
Mining and Metallurgical Patents.....	218
Southern California Enterprise.....	218
Travels of Sound.....	218
Personal.....	223
Commercial Paragraphs.....	224
Obituary.....	224
Catalogues Received.....	224
New Patents.....	224
Notices of Recent Patents.....	224

Life of the Anthracite Mines.

Director Charles D. Walcott of the United States Geological Survey has estimated that the anthracite coal mines will continue to produce sufficient coal to supply the demand for the next 200 years before they are practically exhausted. The estimated aggregate tonnage in these beds, including that already removed, is placed at 19,507,872,325 tons, of which during the past eighty-three years 1,225,581,269 tons have been mined. The production of 1901, when conditions were practically undisturbed, was 57,367,915 tons. At this rate of extraction, the mines would continue to produce for about three centuries longer. The increase in extraction from 1890 to 1900 was about 22%. The anthracite coal averages a larger tonnage per square mile than the bituminous mines, owing to the greater average thickness of the veins of the former.

Profits in Copper Mining.

Reports of the several mining companies producing copper in the Lake Superior region show that, during the year 1902, they were operating on a very narrow margin, the price of the metal at about 11 to 12 cents affording relatively small profit; but with the increase in price to the present figures—14.75 to 15 cents—handsome profits are assured to most of the companies operating there. The reports indicate that some of the companies cannot work at a profit with copper below 12 cents, while others can produce copper profitably at a still lower price. The history of copper mining in that region is interesting, in consideration of the constantly improving methods and the larger scale of operations, together with the wide and sometimes rapid fluctuation in the price of copper.

Arbitration in Labor Troubles.

Strenuous efforts are being made in various directions, by committees appointed for the purpose, to bring to a conclusion and mutually satisfactory settlement the disagreements between employers and employed. For nearly two months the miners of the Crow's Nest Pass region in eastern British Columbia have been on strike for increased pay and recognition of the union—the Western Federation of Miners. Recently an organization, known as the Provincial Mining Association of British Columbia, was formed to promote and foster the mining industry of that province. The organization is composed of men representing almost every class and industry, including mine owners, and operators and mine workers, and as it is one of the aims of the association to adjust, if possible, differences arising between mine operators and their employes, a conciliation committee was appointed by the association to inquire into the cause of the trouble and to arbitrate and, if possible, adjust the matter. As all interests concerned were represented, much was hoped for from their efforts in this matter. After more than two weeks of effort in this direction it was thought that an agreement had been reached that would end the strike which has seriously retarded the metal mining industry of the province, but the verbal agreements were not signed, and as a result orders are being issued to several of the largest mines in the province to clean up and shut down indefinitely, as the smelters cannot operate without coal and coke. The conciliation committee is still at the coal mines, however, endeavoring to bring about an amicable settlement.

In Colorado the strike of the mill men at Colorado City is still in force and the mining industry of the Cripple Creek district is practically paralyzed. The strikers are members of the Western Federation of Miners, which organization ordered a strike February 14 last, alleging discrimination against members of their organization by the mill owners. An advisory committee was appointed by Governor Peabody, March 20, and the gentlemen have since been working faithfully to bring about a settlement, and at one time it looked as though they had succeeded. Manager MacNeill of the American Smelting & Refining Co. agreed to reinstate the strikers, with the exception of a few men, who had become personally obnoxious to him, and these he refused to reinstate under any consideration. It was agreed to accept this condition, the men who were excepted by Mr. MacNeill to be given employment at Victor, but when it was learned that the men to whom Mr. MacNeill had personal objection included several of the most prominent members of the union, the miners refused to sign the agreement, and the strike is still on. In this case, also, the arbitration committee will continue their endeavors.

In California the strike at Keswick continues, the only new feature being that locally it is stated that the Amalgamated Copper Co. is responsible for the continuation of the strike, but this seems improbable. When the miners returned to work after the first strike they claimed a complete victory, but as a matter of fact had gained nothing, and it was thought at that time that the trouble would shortly be renewed. Arbitration has also been attempted in this matter by merchants of Redding and Keswick, but without avail.

Arbitration committees usually accomplish much good, and, although in the instances above cited they have thus far failed to bring about a satisfactory adjustment of the several difficulties, it is not improbable that they may yet solve the problem by securing concessions from both sides to the controversy.

War Tax in the Transvaal.

The mining profits tax is a theme of moment in South Africa at present. This tax is levied in the settlement of the debt incurred during the recent war in the Transvaal. The tax will allow the expense of shaft-sinking and equipment to be considered as capital outlay to be deducted from "profits," but development is counted as working expense. In regard to capital for further development, this will also be treated as working expense. Shaft sinking to the banket is considered capital outlay and not as development. The life of the mine will

be computed on the tonnage of available ore reserves and the capacity of the mills as they now exist. The deduction for cancelling the debt imposed upon each mine by the Government is to be calculated for the life of the mine, and is proportioned to each working year. When the profit for a year's operation falls below the yearly allowance for amortization, both sums will be carried forward.

While the heavy tax imposed by the dynamite monopoly was one of the main actuating causes of the Boer war, the war tax resulting from it is scarcely less onerous, but cannot be evaded, and was a natural outcome of the war and was anticipated.

The Life of a Mine.

Mines of large size and famous record are popular and it is often said of them, "they are inexhaustible." As a matter of fact no mine is inexhaustible, though some possess reserves which insure a long period of successful existence. Most mines are made up of more than one shoot or ore deposit, and these usually differ to a greater or less extent in size and value, and sometimes in character. A mine which makes a record as a producer of high-grade ore is looked to by the public to continue this record, but there are few mines that do not sooner or later depreciate their output, or at least if maintaining it have to treat a vastly larger quantity of ore.

The Mount Morgan mine in Queensland, Australia, at one time a large producer, still makes a large output, but the ore no longer runs an average of \$70 per ton, nor is it quarried from a hillside as formerly, but it is mined from levels far below the surface, as in most other mines.

The mines of Bingham Canyon, Utah, were famous producers in their early history, but the rich, superficial ores, were largely worked out, and a period of idleness came. To-day they are again large producers, but the ores which afford a profit now could only have been worked at a loss in earlier days. Changes in cost of supplies and price of labor, improvement in and cheapening of transportation, and a greater economy in reduction of the ores, together with higher saving of values, have made this possible.

The history of the Comstock Lode of Virginia City, Nev., is familiar to all mining men. The annual output from the Comstock is still large, but it is mostly derived from low-grade ores; but close economy and high extraction of values only make this possible.

There are few large low-grade mines where the value of the ore does not change greatly; but the increased cost of mining from constantly greater depth is only offset by commercial changes for the better, greater economy in all branches and the absence of extravagance. Among mines of this class are the Homestake of South Dakota, the Alaska-Treadwell of Alaska, the large copper mines of Butte, Mont., and some of those of Arizona.

Another important factor in the economy of mining is the merging under one general management of a large number of mines, or mining locations, by which means a great saving can be effected. In the early history of the Comstock there were about forty separate companies, each with its separate manager, superintendent, and heads of various departments and large clerical force, with expensive offices in San Francisco, Cal. The saving which might have been made by the consolidation of several adjoining interests would have represented a large dividend to stockholders, but those were not days of economy. Should another Comstock lode be discovered it is improbable that similar scenes would be enacted, while it is very likely that large interests would be consolidated for economy in working and in management. The life of a mine is determined only when it is completely worked out, as ore left to-day because it is too low grade to pay may in a few years come within the range of "payable ore in sight."

TIN MINING has been carried on in Cornwall, England, for many years, and the natural inference would be that no undiscovered vein would be likely to exist in a district so thoroughly worked as that; but a discovery of good tin ore was recently made in a granite quarry near Kit hill. As the workings thus far are superficial, good profit results from mining operations at the new discovery, over \$15,000 worth of tin having already been produced.

CONCENTRATES.

THE usual method of measuring the economical working of a steam engine is its steam consumption per horse power per hour. When two engines are thus compared they should be operated at the same pressure.

SILLS are advisable under the posts of tunnel sets when the floor of the level is too soft to sustain the posts in position, unless the ground swells, in which event cross sills will prove of more trouble than service.

A 4-FOOT impact wheel, under 200 feet head, with 175 miles' inches of water, will develop about 84 H. P., if the standard nozzle for such conditions be employed. A smaller or larger nozzle will not give the same result.

ORE SHOTS do not always extend upward to the surface, nor, having been found in depth, are they always found to extend to indefinite depth; but they have limitations in all directions—depth, height, width and length.

THE American Smelting & Refining Co. was incorporated at Trenton, N. J., April 4, 1899; capital, \$65,000,000. The incorporators were W. E. Dwight, T. M. Day, Jr., J. J. Tracy, H. W. Thomas, A. P. Bartlett—all of Jersey City, N. J.

In estimating the amount of paint needed for a given surface, divide the number of square feet by 200. The result will be the number of liquid gallons required. Salt-peter solution washed over greasy spots will permit the paint taking hold.

ELECTROLYTIC ACTION does not take place because the electric circuit is a good conductor or a bad conductor, but because it is a mixed conductor. The current must pass from the metal into an electrolyte before electrolysis will take place.

THE color of the croppings of the Homestake mine at Lead, S. D., is that of anhydrous iron oxide—red. In depth the ore is white quartz with green hornblende schist of silky luster. The ore bodies are accompanied by intrusions of dike rock felsite.

SULPHURETTED HYDROGEN is sometimes employed as a precipitant of gold from its solutions. It has been used for this purpose in the bromine process. It is usually generated by the action of dilute hydrochloric or sulphuric acid upon iron sulphide.

WHEN a prospector locates a mining claim he should also at once investigate the water supply, as a means of power, or, if that be unobtainable, he should, at least, endeavor to secure sufficient water for reduction works by locating an unappropriated water right.

THE ability of the machine is beginning to outrank the ability of the man, and in the test it is the man that is beginning to fail. The locomotive to go 100 miles an hour is less difficult to build than it is to get the locomotive engineer who can drive it and retain his nerve control.

TAPPETS that are screwed onto the stamp stem are in use in some Australian and New Zealand mills, but as far as known at no place in America, where tappets are secured by means of gibs and keys. The American style of securing tappets is displacing the screw type in those colonies.

TELLURIDE GOLD ORES are often found to be free-milling at and near the surface, though this is not universally the case. Ores containing tellurides of gold may be made free-milling by roasting; but there is often considerable loss of value when this is attempted on a commercial scale.

TEN CENTS per kilowatt hour would be a cheap charge for electric current. A 16-candle power lamp at 110 volts would take half an ampere, using 55 watts per hour. Thus ten lamps in ten hours would use 5500 watts or 5.5 kilowatt hours, which at 10 cents per kilowatt hour would be 55 cents.

POWDER STAINS may be removed from the face by the use of hydrogen dioxide. The face should first be washed thoroughly and then covered with pieces of lint saturated with glycerine one part and hydrogen dioxide three parts. In two or three days the particles and stains of powder will have disappeared.

THE total pressure of quiet water in a dam, tank, or other surface, can be found by multiplying together the area in square feet of the surface sustaining the pressure, the vertical depth in feet of its center of gravity below the surface of the water, and the constant 62.5. The product will give the pressure in pounds.

THERE are three great copper producing districts in the United States, and each district mines a different character of copper ore. The copper produced in the Lake Superior district is almost wholly from ores containing native copper. The copper produced in and

about Butte, Mont., is mostly from sulphide ores, such as chalcocite and chalcopyrite. The Arizona copper is mainly produced from the carbonate azurite and malachite, while a small percentage is from the oxide cuprite.

SILVER usually accompanies gold in veins, though often in very small amount. The fineness of vein gold is usually about 800 to 900. Almost invariably placer gold has a higher fineness than that of the veins from which it came. The gold of the Juarez placers in Lower California, Mexico, is reported to be worth \$20 per ounce.

IN the case of beams supporting loads, with equal lengths, the diameters vary as the cube roots of the loads; or, the cubes of the diameters vary as the loads. If a beam 11 inches in diameter supports a load of 32,160 pounds, a beam of the same material and same length, 9 inches in diameter, will support a load of 19,446 pounds.

A TON OF ORE containing iron-copper sulphide and 30% silica and other earthy minerals carries about 630 to 650 pounds of sulphur, the greater part of which, upon treatment in a smelter or by roasting, escapes into the air, uniting with oxygen to form sulphurous oxide (SO₂). This varies according to the proportion of pyrite to chalcopyrite in the ore.

THE cheapening of aluminum is due to the introduction of the electric furnace in its manufacture. Aluminum is one of the most abundant of elements, but there are only a few minerals from which it can be profitably extracted as yet; the principal ones are cryolite (an aluminum, sodium fluoride) and bauxite, an aluminous oxide, sometimes called aluminum ore.

IN making experiments on or for anything in the way of a mining and metallurgical process or appliance it is essential that for any practical resultant good all the conditions and requirements of the larger plan in view should be included. One cause of failure in "laboratory processes" is the omission of the things that would enter into the question when on a commercial basis.

THE zinc mineral hydrozincite, sometimes called marionite, is a hydrocarbonate of zinc of little importance because of its rarity. It is wholly found as an incrustation on smithsonite or sphalerite, never crystallized; hardness 22.5, gravity 3.5. Spain produces some, and as marionite in fibrous white crust on smithsonite ores of Marion county, Ark., with sphalerite at Joplin, Mo., with smithsonite at Magdalena, N. M., and Durango, Mexico.

IRON TAMPING BARS are considered almost as dangerous in tamping nitro powder as black powder. It is not necessary to secure good results that a blast should be tamped down with a hammer, even when a wooden tamping stick is used. Even loose tamping seldom blows out of a hole charged with nitro powder. In wet holes the paper containing the nitro compound should be tightly tied about the fuse and axle grease well rubbed on to prevent water reaching the cap.

WATER flowing in a wooden flume may safely have a velocity of 7 or 8 feet per second; but in an earth ditch it should not exceed 3 feet per second. A good grade for a flume is about 2 inches in 100 feet. The velocity of water in a flume 3 feet wide, carrying a stream 18 inches in depth, with $\frac{1}{4}$ -inch grade to the rod, is 2.6 feet per second. With $\frac{1}{4}$ -inch grade the velocity will be 3.7 feet per second, and with $\frac{1}{2}$ -inch grade per rod the velocity would be 5.3 feet per second. In the latter case the flow would be 1431 cubic feet per second.

LEUCITE ROCKS were for many years supposed to occur only in certain localities in Europe. In 1874 Vogel-sang discovered an Asiatic leucite in basaltic rock on the island of Baucau, north of Java. The petrographic investigation of rocks of the fortieth parallel in the United States by F. Zirkel resulted in the discovery of rocks rich in leucite in Wyoming. More recently rocks containing leucite were found abundantly in the Black Hills, South Dakota, and in Cripple Creek district of Colorado in phonolites and allied rocks. Leucite is usually associated with nepheline.

THE proper treatment of an ore containing precious metals can only be determined by actual experiment. The variations of stamp milling practice are so wide, though all along the same line, that it is impossible to say which method will best work any particular ore without trial. Concentration is one of the most important features of milling gold ores, and this until very recent years received less attention than it deserved. In the light of metallurgical knowledge of the day there is little ore that cannot be satisfactorily treated by some one of the various processes.

SHAFT SINKING may usually be accomplished with a bucket better than with a skip, as the former can be easily moved about at the bottom of the shaft, thus facilitating loading. In deep shafts the tendency to swing is overcome to great extent by use of a crosshead running on guides in the shaft. Where there are three compartments in a shaft arrangements should be made to run the bucket or skip in the central compartment. In inclined shafts the skip is generally preferred, as extension tracks may be placed to allow the skip to reach the bottom of the excavation. No figures of cost in

shaft sinking are of value unless all the conditions under which the work was accomplished are known, as the cost varies greatly in different shafts, even in the same district. A shaft sunk in soft ground can be carried down much faster, and therefore less expensively than one in hard rock, but the soft rock shaft often proves in the end to be the most expensive, owing to the cost of maintenance.

ZINC is mined in several localities in the United States, the ores of Missouri, Kansas and Colorado being the sulphide sphalerite. In Arkansas there is mined carbonate of zinc and smithsonite, and in Virginia carbonates and the silicate calamine. The only known locality in the United States producing zinc oxide is at Franklin Furnace, N. J., where the minerals zincite and franklinite are mined. The peculiar yellow carbonate of zinc, sometimes called "turkey fat," from the fact of its resemblance to the fat of a turkey, is only found in the United States, in Marion county, Ark., and in small quantity.

THE amount of iron ore estimated to be in sight in the Mesabi iron range, in Minnesota, is 500,000,000 to 700,000,000 tons—this is ore containing over 58% metallic iron. The amount of ore containing under 58% metallic iron is known to be very large, but no estimate of the quantity has been made, owing to insufficient data. At some of the mines where it can be done inexpensively, where the lower grade ore has to be moved to get that of better quality, the low grade is being piled for future use. Other iron ranges of the Lake Superior region were estimated in 1902 to have a reserve of 350,000,000 tons of ore.

NOT all sandstones are suitable for building purposes or foundations. The life of a rock varies with its ability to resist weathering, and uniformity of texture is necessary to a first-class stone. A small amount of clay in fine-grained sandstone will not lower its strength, but if coarse-grained and porous it will absorb water and cause the rock to swell and crumble. Iron sulphide is undesirable also in building stone, as it has a tendency upon oxidation to cause the stone to disintegrate. Sandstones should always be laid with their bedding normal to the pressure, or the stone, unless very strong, will split or crumble under direct pressure.

NOTHING in the reading columns of this paper is paid for in any way by anyone. Anything deemed of sufficient public interest to the readers is published. The editors are the judges of that. The paper will not publish an advertisement "pure and simple" in form identical with the regular body of reading matter. This is because the management of the paper is unwilling to have anything which is paid for as an advertisement go before the readers in a form which would lead them to believe it to be editorial matter, and, therefore, not paid for. It is merely a question of integrity and good faith as between the management of the journal and its readers.

COBALT is produced at the Mine La Motte, Missouri, in connection with nickel. The matte containing the nickel and cobalt is refined in New York and at Camden, N. J. It contains about 13% nickel and about 8% cobalt. About 50,000 pounds of cobalt oxide is annually imported into the United States. The principal sources of supply are the cobaltiferous ores occurring with nickel ores. The average percentage is low, often less than 1%. Ores and mattes containing small percentages of cobalt will be received by metallurgical establishments. Cobalt oxide is worth about 18 cents per pound. Fuhrman's Manual of Assaying gives complete tests for cobalt and nickel ores.

IN laying a sewer pipe there should always be a grade which will give a self-cleaning velocity. This will depend upon the character of the sewage. For 15-inch sewer, if 2 feet a second is assumed as the self-cleaning velocity, the minimum gradient would be 0.133 or 1.6 inches per 100 feet. By Kutter's formula the velocity of flow in a sewer on this gradient would be slightly over $\frac{1}{4}$ feet per second. These velocities are computed for sewer running full or half full. If the usual flow of sewage is very small, and flushing flows are infrequent, the gradient should be increased as the volume of constant flow is reduced. Many sewers have been laid on less gradients than the minima here stated, but always with the expectation of later expense for cleaning.

IN recent years the business of gathering and selling mineral specimens has grown. There are now about thirty mineral specimen dealers in the United States, the dealers in New York, Philadelphia, Rochester and Washington, D. C., being especially active in their hunt for specimens. New minerals and new localities are eagerly sought for by them, and it is not an unusual matter to expend thousands of dollars to secure some valuable find. These concerns have their men out all over the world looking up specimens. Two companies in the business have a paid up capital of \$50,000. There are estimated to be a hundred thousand people in the United States that might be called mineral collectors. The colleges and museums are the largest buyers of specimens. The cities of New York, Chicago and Washington have fine mineral collections, New York in its American Museum of Natural History, Washington in its National Museum, and Chicago in its Field Museum. Many of the larger cities have not even made a start on a collection, but as an educational feature each city of any importance will eventually establish a collection.

The Elimination of Arsenic, Antimony, Lead and Zinc From Copper Mattes.

Written for the MINING AND SCIENTIFIC PRESS by
S. E. BRETHEBERTON.

I propose to show that the above metals are not so objectionable as generally supposed, if smelted in an ordinary blast furnace with hot blast and making a normal slag, such as one would aim to make under ordinary conditions with cold blast. We obtain all our Fe from iron sulphides.

In order to avoid controversy and save time, as I am too busy to do the subject the justice it deserves, I shall only give a brief description of our smelting practice as followed at the Val Verde Copper Co.'s works at Val Verde, Ariz., during the past twelve months, which practice shows conclusively that it is not necessary to do any preliminary roasting when smelting copper ores containing S and As, or dread those objectionable elements as we have in the past, as they are sufficiently eliminated in blast furnace smelting.

We not only have S and As to contend with, but also Pb and Zn, and some Sb, all of which we have eliminated from the matte so as to produce a marketable product, free from As and Sb, and below the limit for Zn and Pb as penalized by the refineries. The copper has to be not less than 45%, while the charges smelted last winter and spring averaged about as follows: 1200-pound charges (all ore from different mines), one of which contained the necessary CaO and also MgO, with some Cu, so that it was classed as ore. The mixture averaged:

Wet Cu.....	2.5
Fe.....	23.0
MgO and CaO.....	8.5
S.....	21.5
As.....	7.1
SiO ₂	21.6
Al ₂ O ₃	3.7
Zn.....	4.5
Total.....	92.4

The balance of the 100% was Co₂, O, Ph, etc. In addition to the 1200 pounds, 300 pounds of coarse slag was used on account of the fine ore (sulphide), making a total charge of 1500 pounds, with which we used 60 pounds of coke, containing 25% ash, and blast heated from 400° to 450° F. We reduced the coke to 45 to 55 pounds to the charge and raised the temperature of the blast to 550° to 600°, but, after several weeks' running, finally decided that we required as much coke for the regular working of the furnace with 600° temperature as we did with only 400°. Our first matte product was rich in Au and averaged 23% to 30% Cu, no As or Sb, with a trace of Pb and Zn. This matte was resmelted once with siliceous copper ores, sometimes partly oxidized, to produce the 45% to 50% Cu matte for shipping. The siliceous ores are, and were then, any class obtainable on the market, assaying from less than 1% to 10% Cu.

Since last spring the situation has changed, until now we have less As, but more S, Pb and Zn. The Pb we do not attempt to save under 10%, as it is cheaper to burn it off in the copper matting furnace than to roast it and then smelt it in the lead furnace with a high percentage of expensive coke, even if we could save all the Pb. Coke here is more expensive than in Leadville, Colo., where I was in charge of lead smelters for eleven years, and where for weeks at a time my charges did not average much more in Pb than the following mixture; but at that time it was a question of saving the Pb, which we did quite satisfactorily, whereas now we are compelled to get rid of it, mostly by volatilization. Ores and concentrates containing more than 10% Pb we smelt in the lead furnace.

Our present smelting mixture here is, and has been for the past three months, as follows:

320 pounds sulphide ore,
60 to 100 pounds lime rock,
860 to 840 pounds bricked sulphide concentrates,
400 pounds coarse slag.

1,640 pounds,

with which we use 50 pounds of coke containing 18% to 19% ash. At times we drop the coke to 40 and 45 pounds.

The 1240 pounds of ore and flux averages 7% Pb, 7.1% Zn, 2.1% wet copper, 23.2% S and 1.3% As. The matte in this case is again free from As, but contains only 13% to 15% Cu. The Pb and Zn are also over the 3% limit, but is eliminated to below that percentage when rerun for shipping. I attribute the poorer concentration now not so much to the slight excess of S over the first charge as to the shortage of silica and the Pb and Zn contents, which metals are so difficult to desulphurize in ordinary roasters.

Last summer when I had mixtures on containing more S but very little Pb and less Zn, the concentration was between 7 and 8 to 1, about the mean between what it is now and what it was last spring. Another reason, no doubt, is on account of the bricks

now being frozen and containing so much H₂O. This keeps the top of the furnace cooler than we want it, although the crucible keeps hotter. The slag has always been very clean, showing a little more than a trace in Au, Ag and Cu, and our metallurgical showing excellent.

The wood consumed for heating 3700 cubic feet of air per minute to 400° amounts to one and one-half to two cords in twenty-four hours.

The smoke, when the furnace is making the best concentration, is a beautiful sight to watch on a clear day, changing from a gray white, just before the feeder puts in a charge, to a dark red, greenish yellow and (when we had so much As) orange yellow, showing the different stages of oxidation as the fumes pass off with sulphide of arsenic when the furnace top is coolest.

This system of smelting requires much more care on the feeder's part than when using plenty of fuel with roasted and oxidized ores. For with us depending on the iron in the sulphides entirely for fluxing purposes, outside of the 9% to 10% lime, excess fuel prevents concentration, causing an increased matte flow carrying the iron intended for the slag into the matte. This often causes trouble, due to the slag becoming too acid and an accumulation of zinc, arsenic and lead forming in the crucible, gummy in nature and similar in composition and appearance to the sows found in lead smelting crucibles.

Should the furnace get cold and require extra fuel, it is better to feed a charge or two of slag, or harrings—should there be any on hand, and increase the coke to 9% or 10%; as the barrings being partly desulphurized and the slag containing but little over a trace in sulphur, the extra fuel is not a detriment, and of course this charge is also coarser than the usual ore charge, which starts the furnace to running faster, so that the expense of feeding two or three of these charges of half slag or half ore (with a little extra coke) on each shift is more than offset by the faster running of the furnace.

It is self evident that smelting such refractory ores as we have here with cold blast would be out of the question, not only on account of the extra expense for roasting and extra coke in the blast furnace, but the fact that arsenic and lead would be reduced into the matte so as to make it unmarketable.

One smelting plant, not far from here, several years ago made a matte containing 16% arsenic and a lot of regular speiss.

I understand that another smelter in this vicinity, with cold blast and the usual amount of coke, eliminated the arsenic very successfully by running with a siliceous slag and a hot top furnace, but the smelting campaign was too short to prove that it would be a continued success.

My experience with cold blast and using the necessary coke, say 10% at least on the burden, and getting a hot top, due to the siliceous slag, meant a good concentration, but only a few shifts could be run before freezing up, unless the furnace was repeatedly physicked with extra fluxes and coke, which neutralized the benefit gained by the hot top and the furnace would smelt very slowly; even then we were not able to prevent freezing up often.

We do not find it very expensive and it is a simple arrangement we have here for heating the blast, designed by the writer, and patented, on the same principle as a tubular boiler, the heat passing through several hundred flues, which strengthen and hold the box together, the blast passing back and forth through the inside of the box en route to the furnace from the blower. The flue ends are protected over the firebox with copper thimbles inserted and expanded on the inside and well headed on the outside over the heading of the flues. The steel plates (copper would no doubt be better) do not huckle, except directly over the firebox, and very little there, due to its being so thoroughly perforated by the flues, which act as heat distributors.

At this writing we are running with only forty pounds of coke on a 1600-pound burden, after several weeks' run with only fifty pounds of coke to the charge; tuyeres all open nicely, matte 2% higher in Cu than with fifty pounds of coke. The furnace has been running very free for a week or more, but the SiO₂ is too low in the slag and the Fe too high for clean work; that is, the Au and Ag since reducing the coke, and driving more Fe into the slag, the CaO is down to only 7% in the slag, SiO₂ 33%, making the specific gravity of the slag too high. Both my feeders and furnace men now want me to try running without any coke, but I am willing to leave well enough alone.

We expect to use moderately heated blast with our lead furnace in a few days.

ONE of the most satisfactory methods of obtaining daily samples in headings, of any description, in mines is by testing the drillings, particularly those which cross the strike of the vein. Drill holes running parallel to the walls may follow rich or poor seams, and consequently convey a false impression of the average value of the ore.

THE mineral wealth of the districts about Cottonwood and Bingham canyons, Utah, was discovered by Government troops located in that vicinity, and were the first discoveries made in Utah.

Cambrian Ore Deposits in the Black Hills.

Written for the MINING AND SCIENTIFIC PRESS.

The existence of gold in the Black Hills of South Dakota was known to the Sioux Indians, whose reservation embraced those mountains, but the first authentic account of its discovery was made known by a half breed in 1874 at Fort Laramie, Wyo. He had a few grains of gold in quills which he claimed to have obtained in the bed of a stream in the foothills of the Black Hills. Although still an Indian reservation, a stampede occurred in 1875, but the reservation was not opened to settlement until 1876.

There was a large influx of prospectors and adventurers in 1876, when most of the best placer deposits were discovered and to a great extent worked out, though placer mining continued to thrive for several years. In 1876 the Homestake mines and many others were discovered. The value of the ore deposits in the Cambrian was also early recognized in several localities, the most important being those near Bald mountain, on Green mountain, and near Terry's peak, about 7 to 10 miles south of Deadwood, and those on Bear Butte creek, at Galena.

The geology of the Black Hills is simple, except where intrusions of igneous rock and extensive faulting have locally disturbed the strata. The basement rocks are micaceous and garnetiferous schists and slates, quartzites, amphibolite schists and other crystalline rocks of Archæan time, with ancient intrusive dikes. This terrane was an island in the Cambrian sea. The degradation of the Archæan hills resulted in the formation of heds of shingle along the ancient shore line, extending entirely around the Hills, which subsequently became cemented into a firm conglomerate. The cementing material was either silica, iron oxide, carbonate of lime or clay, or a mixture of these minerals. The conglomerates vary from a few scattered pebbles to heds over 40 feet in thickness, as on Castle creek, near its confluence with the south fork. The entire region was one of subsidence in Archæan time, and heds of sand 10 to 40 feet thick were deposited upon the shingle. Following this were alternating deposits of calcareous and argillaceous material intercalated with heds of red sand. These latter formations contain large amounts of the iron silicate called glauconite (green sand). At the top of the Cambrian was another heavy deposit of fine sand, which, as well as that at the base of the formation, later became consolidated into a dense, firm quartzite. Following the Cambrian were successive deposits of limestone, sandstone, etc., to the close of the Cretaceous, when the entire Black Hills section was uplifted. This movement was accompanied or caused by the intrusion of igneous rocks, chiefly rhyolite, trachyte and phonolite, forming many laccoliths, in the northern Hills. The sedimentary series extended like a great flat dome entirely across the uplift, the central portion being later eroded, exposing the underlying Archæan rocks, and the edges of the sedimentary series surrounding them.

In these latter the ore deposits are extensive and valuable, particularly in the Cambrian, though ores (chiefly lead-silver) are found in the Carboniferous limestones. The most noted of the latter are at Galena and at Carbonate. The ore deposits in Cambrian quartzite contain a greater value in gold than in silver and carry, except in a few isolated places, relatively little lead. As already stated, the conglomerates at the base of the Cambrian contain "placer" gold, derived from the underlying gold-bearing Archæan schists. Gold is known to occur in these conglomerates near Central City, at Rockerville and near Bear gulch. On the south fork of Castle creek the Cambrian conglomerate contains native copper in disseminated grains. The bedrock at this place is black slate containing copper, indicating that the metal was derived from the older rocks.

The lower quartzites immediately overlying the conglomerates, or lying upon the upturned edges of the schists in the absence of the conglomerates, and the indurated shaly beds resting upon the quartzites, and also the upper quartzites, which occur from 200 to 250 feet above the basal members, are the most important horizons of ore occurrence in the Cambrian.

In these strata occur a large portion of the gold-telluride ores which have been extensively developed within the past fifteen years. No metallurgical problem was more vexing than the successful treatment of these ores from their discovery in 1876-77 to 1887. Each new undertaking prior to the latter date added only one more failure to those which had previously been made, but the introduction of the harrel-chlorination and cyanide processes has made a high extraction of values from these ores possible at relatively low cost.

The Cambrian heds are fractured and intruded by sheets of eruptive rocks injected from some neighboring vent, forming numerous extensive laccoliths. Subsequently both sedimentary heds and sheets of eruptive rock were cut by intrusive dikes, and it is in more or less direct association with the latter that the ore deposits of the Cambrian were formed. These ore shoots exist as impregnations in the

quartzites and shales, containing a large amount of silica and conforming to the enclosing beds, varying in dip with them, but as most of the intrusive dikes have a northwest-southeast strike the ore shoots follow approximately the same strike, regardless of the dip, being anomalous in this respect. Not only is this true of single ore shoots but also of whole systems of such shoots, a series of ore bodies being found to extend in a northwesterly direction for several miles, where erosion has not entirely removed the deposits. And in this connection it may be mentioned that erosion has removed ore which in place would be worth many millions of dollars, but unlike most gold deposits the erosion of these telluride ore deposits did not form rich placers owing to the fine state of division of the gold in the ores.

The erosion has been of such a character that the hard quartzite is often found extending over considerable areas, everything above it having been removed. This is particularly true of the lower quartzite, which in places cover several square miles of territory. This fact often makes the ore bodies easily accessible, particularly in the neighborhood of Terry's peak and Green mountain, but westerly from there about Ragged Top the quartzites are covered by several hundred feet of limestone and sandstones, and it is only along the canyons that the quartzites are accessible.

In many places erosion has left extensive and valuable ore deposits lying practically upon the surface where they may be quarried out at minimum expense. (See illustration of the Lucy mine on front page.) Most miners prefer a vein pitching into the earth at a high angle and extending to unknown depth, but in some of these Cambrian deposits are found the ideal mine. Its limitations are easily and quickly determinable. The ore is practically all "in sight," sometimes a few feet of stripping is necessary, but on the whole, as the values are relatively high, an ore deposit of this diameter forms a satisfactory mine, as the expense necessary to operate can be readily determined, and when the ore has all been mined the expense stops with the removal of the last ton of ore, and no money need be expended in the fruitless search for more ore where it is known none exists.

The ore bodies are irregular in shape, varying from thin sheets to upwards of 20 feet in thickness, usually thinning out toward the edges. They often occur along or near one of the intrusive dikes, extending from a few feet to 100 feet or more on either side of it. Where the ore bodies are covered with large masses of igneous rock or the overlying sedimentary formations they are reached through shafts and mined in the same manner as other underground deposits, though very few of them have a high angle of dip, lying usually nearly flat. In the early history of their development large amounts of ore were shipped to smelters at Omaha and Denver, even before the advent of a railroad nearer than 180 miles. Ores of this class were high grade. During this period attempts were made to treat the high-grade ores in mills locally, but the failures were so complete that these attempts were finally abandoned. W. H. S.

SULPHUR is a non-metallic mineral. It is found native about many volcanic vents, and sometimes in mines, as a secondary product of the oxidation of sulphide ores. A mine on Cedros island, off the west coast of Lower California, produced specimens of native sulphur which contained about \$100 gold per ton—a very unusual occurrence. Sulphur combines with many metals to form sulphides, sulphates, etc. It occurs more or less abundantly in ore piles that are being roasted for treatment in smelters, the sulphur being driven off from the ore sublimes when approaching the cooler surface of the ore pile, the sulphur being deposited in small crystals on the exposed rock surfaces.

THE barometer falls about one-tenth inch each 90 feet of ascent above sea level, for the first 1000 feet, but the rate of fall continues to decrease, as, for instance, at an altitude of about 5000 feet it falls one-tenth inch for 160 feet in increased elevation. The boiling point of water is also often employed to determine elevation above or below sea level. At 500 feet below sea level the boiling point is 213° F.; at sea level, 212° F.; at 5279 feet it is 201.9° F.; at 10,011 feet it is 193.2° F.;

The Ratcliff Mine.

In the issue of July 12, 1902, of the MINING AND SCIENTIFIC PRESS the editor took occasion to remark: "Mining is to-day the most profitable of all indus-

Originally located by Mr. Ratcliff, this property was purchased a few months ago from J. T. Nichols of Detroit, Mich., W. W. Godsmark of Los Angeles, Cal., and others. It is on the southerly side of Pleasant canyon, on the western slope of the Panamint mountains, 6 miles from Ballarat, 72 miles northeast-

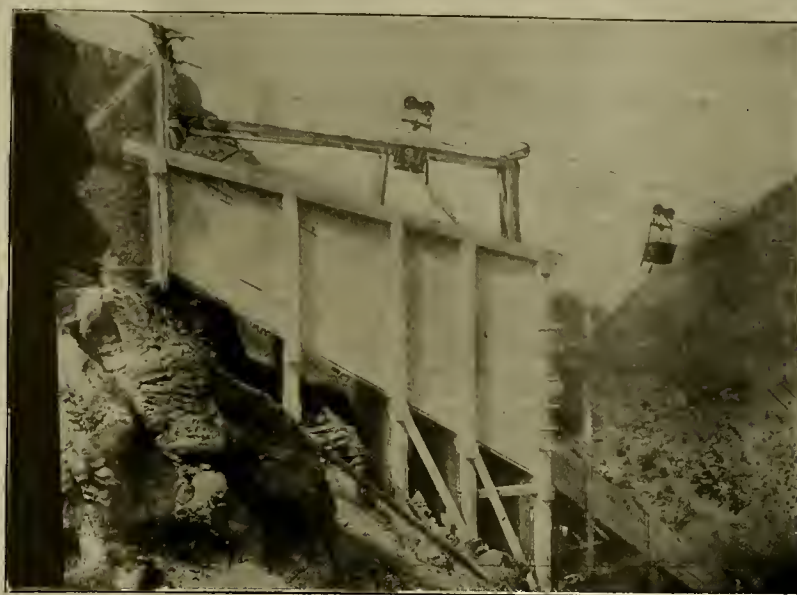


Fig. 1—Gravity Aerial Tramway, Ratcliff Mine, Cal.



Fig. 2—Mill and Camp, Ratcliff Mine, Cal.



Fig. 3—Adit Tunnel, Ratcliff Mine, Cal.

tries, and this commercial fact is attracting capital and enlisting the attention of the brightest minds more and more every year." That assertion is being constantly exemplified. One of the latest enlistments of capital and knowledge is the acquiring of the Ratcliff mine, in Inyo Co., Cal., by the International Equipment Co., with offices in Los Angeles, Cal.

erly from Johannesburg, at an altitude of 6600 feet. There are four full and six fractional mining claims—eight of which are patented—one millsite, and two developed water plant claims, a total of about 150 acres. The mine is on a mineralized zone having a thickness of 150 feet, granitoid strata as a base and quartzite for a capping. The company's claims

cover about 4500 linear feet of this zone. The workable ore bodies, an oxidized portion of the vein, now developed show a varying thickness of from 5 to 40 feet, near the foot wall. A conservative estimate of the average value of this ore body is placed at \$10 per ton.

It is the intention of the company to install labor-saving devices to increase the output and lessen the cost of production.

The men who examined the property for the company estimated that with improved machinery the mine can be worked and the ore milled at a cost of \$3 per ton. These ore bodies consist principally of original strata, impregnated with siliceous iron sulphides and gold, while intercolated with them are high-grade ore bodies or veins consisting of secondary quartz and sulphides. One hundred feet of the mineralized zone intervening between the hanging wall and foot wall ore bodies ranges in value up to \$10 in gold, with an average of about \$4. It is expected that much of this ore can be worked at a reasonable profit when a plant of proper character and sufficient capacity has been installed.

The oxidized portion of the ore bodies, as stated before, is free milling and cyanides up to about 85%. The mine is situated at a vertical elevation of about $\frac{1}{2}$ mile above the mill and all ores are conducted from the mine to the mill by gravity tramways (illustrated in Fig. 1), which are nearly 4000 feet long. The water for the mill is developed by a long tunnel driven in the side of the hill, and is conducted under 1400 feet pressure for a distance of 11,300 feet through a 4-inch pipe line.

The reduction plant consists of a 20-stamp mill and a 50-ton cyanide plant. The capacity of the cyanide plant is to be increased to 100 tons per day. The managers are making a general overhauling of the plant, repairing the old and installing new and improved machinery. The Llewellyn Iron Works of Los Angeles, Cal., is supplying them with a new set of mortars, which will increase the amount of ore possible to put through the mill. Fig. 2 gives a general view of the mill and camp.

Developments in the property consist of five adit levels, with two winzes, between levels Nos. 1 and 2 and 2 and 3, numerous small exploration upraises, winzes, lateral and intermediate drifts and chambers, an open cut 140 feet in length, 50 feet in breadth and 60 feet in height, from which considerable gold has been extracted. Its inner wall, at the mouth of the upper or adit level No. 1, is in pay ore. The aggregate of development work is about 2400 linear feet. C. E. Mort is superintendent in charge of the property. An expenditure of from \$15,000 to \$20,000 is proposed. O. S. BREESE.

Los Angeles, Cal., March 25.

Copper Mining in Upper Michigan.*

NUMBER III.—CONCLUDED.

Written by J. F. JACKSON.

The experiments with long plumb lines noted above suggested the making of experiments with pendulums to determine anew the value of (G) the acceleration of gravity. The only suitable instrument for this purpose was owned by the United States Government. President McNair succeeded in interesting the officials of the United States Coast and Geodetic Survey in the project. The sets of delicate instruments were placed at his disposal and Major Harrod, chief computer of the Survey, was, at his own request, detailed to assist in the experiments which were carried out two or three months ago. Two stations were erected—one at the surface and another 4000 feet below. The stations were connected by telephone and telegraph, and means were devised for determining with great accuracy the differences in times of vibration between half-second pendulums at the surface and at the station 4000 feet below. From the data thus obtained, equations may be written and the value of (G) determined. The results of these tests will be published by the Survey some time next year.

Returning now to No. 5 shaft, you learn that the cage is hoisted at the rate of 50 miles per hour (4600 feet per minute) and that it is loaded and unloaded at top and bottom in a very few seconds. If you are underground at the "plat," or end of the crosscut next the shaft, and the attendant signals for the cage to stop for you, you are apt to be treated to another surprise in the shape of an object lesson on the elasticity of steel cables. When the hoisting engine stops, the cage dangling at the end of 5000 feet of $\frac{1}{2}$ -inch cable jumps up and down 5 or 10 feet, giving the gates or supports on which it finally comes to rest some tremendous thumps.

The inexperienced underground visitor is apt to look with considerable apprehension at the great mass of rock over his head and is disposed to make some inquiries about timbering. The Quincy and several other mines use but very little timber, except in the shafts, and thousands of feet of unsupported hanging wall may be seen where the copper rock has been removed from stopes. At the Calumet & Hecla and Tamarack, however, a great deal of timber must be used to hold up the hanging wall. The Calumet & Hecla use something like 30,000,000 feet per year of

12x12 pine, which is framed by machinery and put in in square sets. The Tamarack, which is on the same lode at greater depth, uses round timber stulls, which are pine logs from 12 inches to 4 feet in diameter, and are set up in groups of three or four which stand close together. There are spaces of 8 feet to 10 feet between the groups or batteries of stulls. These timbers are cut to length at surface, lowered into the mine and set normal to the plane of the lode, where they are wedged tightly into place. This timbering must follow the stoping pretty closely to prevent falling of rock. Where a large area on a particular level or a number of adjacent levels is stoped out, and the timbers have become pretty well decayed, the great timbers crush in and rock fills up the excavation. Miners sometimes hasten the process by blasting out some of the supporting timbers. The caving seldom happens unexpectedly. When it does happen suddenly, men working in the vicinity are sometimes thrown violently for some distance by the force of the air current set in motion.

It is, of course, impossible by the use of timber to support the rock from the surface to a depth of 5000 feet. The pressure would be something like 750,000 pounds per square foot. When caving occurs, the rock seems to break back in the hanging to a strong stratum of rock about 150 feet above the copper stratum which is being worked. Pillars are left on both sides of inclined shafts, so that they do not suffer injury when caving takes place.

At the Quincy mine there are some very large areas of ground at great depth, which are not timbered, and are supported here and there by pillars of poor rock. Recently two severe shocks—not unlike earthquake shocks, except that they came singly and several weeks apart—have been felt in the vicinity of the Quincy mine. Houses situated 2 or 3 miles from the mine were shaken to an alarming extent. Smaller shocks have frequently occurred in previous years, and the common explanation has been that they were caused by "air blasts" in the Quincy mine. In the mine itself, however, but meager effects are observable. Sometimes small masses of rock have fallen from the hanging wall and created a violent current of air. There has been a great deal of mystery about the whole phenomenon, but to my mind it admits of a very simple explanation. The air blast is the effect and not the cause. At the Quincy the rock does not cave in the same manner as at the Tamarack; but movements which occur may extend to some point near or quite near to the surface. There are hundreds of acres dug out at 3000 to 5000 feet in depth. Let us suppose, for example, that five acres in one body had been stoped out at a vertical depth of, say, 4000 feet, leaving only comparatively small pillars of solid rock here and there to support the roof of the cavity. If you calculate the weight of rock lying above this area, you will find that it amounts to something like 60,000,000 tons. Now, if these 60,000,000 tons on our hypothetical five acres happen to get a little uneasy and shift its position ever so little, say, only an inch, or less, I think most of us would concede that sufficient energy would be generated to create a serious disturbance which would be felt at a considerable distance. Let us concede, then, that the power of man to produce earthquakes is one of the latest achievements of modern man to be recognized. As stated before, the caving at the Calumet & Hecla and Tamarack is supposed to extend only 150 feet or so, and that in falling the rock, being broken up somewhat, occupies more space than it did originally; still, when very large areas in the two mines are stoped and caved in, the rock above the 150-foot stratum may give way even to the surface and cause a shock which might be serious enough to damage buildings all over the city.

This predicting of seismic disturbances is somewhat new business to me, but I simply want to make it clear that settlement of ground above a deep mine is a different phenomenon from the caving in of small amounts of earth and rock at an iron mine, or the fissuring or settlement of ground at shallow coal mines. At No. 5 Tamarack shaft house rock is crushed before being sent to the stamp mill. One and one-half-inch cables from the four hoisting compartments of the shaft lead over the four 12-foot head sheaves, which are at the top of the building, 112 feet from the ground level. The illustration on page 199 is that of the No. 5 Nordberg hoist of 6000 H. P., two of which, installed side by side, are required to operate the four hoisting cables. The winding drum, 25 feet in diameter and 20 feet long, and weighing 100 tons, is mounted on a 50-ton shaft, and is rotated at forty-five to fifty revolutions per minute by four engines, two at each end, located as shown. These hoists work in balance and are capable of hoisting six tons from a vertical depth of 6000 feet.

Of late a great deal of attention has been paid to economical steam plants. A number of plants of 1000 H. P. or more have recently been equipped with condensing machinery, automatic stoker and economizers. The Tamarack can store 150,000 tons of coal at the docks. Coal is brought direct by vessel from Cleveland and other lake ports, and the equipment for unloading and handling coal is of the best.

Hoisting drums are run by simple engines; air compressors have usually triple-expansion steam engines, although one of 100 drills' capacity, with quad-

ruple-expansion steam engines, is now being installed at the Champion mine. The builders of this compressor confidently expect to set a new record for high steam economy. The various stamp mills, with two exceptions, are supplied with triple-expansion steam pumps of 20,000,000 gallons or more per day capacity. The Tamarack has a pump of 40,000,000 gallons capacity; the Calumet & Hecla one of 65,000,000 gallons capacity, pumping against a 60-foot head. This pump is rather larger, I think, than any in use in municipal water works anywhere.

The Baltic and Atlantic mills are supplied with water from a storage reservoir on the Salmon Trout river, near where it empties into Lake Superior. The river is dammed by a steel and concrete structure, designed by the writer, which is 74 feet in height by 472 feet long. A full description may be found in Engineering News of Aug. 15, 1901. This dam is notable in that it is the first steel dam of considerable size to be constructed, and particularly on account of the fact that it is a gravity structure—that is, its stability against sliding and overturning is calculated and provided for exactly the same as is done in the ordinary masonry dam. The dam has been in use about a year and seems to be a highly satisfactory structure. It seems to me that a design of somewhat similar sort should especially commend itself for use in volcanic countries, where masonry structures would suffer great damage from earthquakes. Stamp mills are usually placed on the side of a hill near the lake shore at such an elevation that the waste sands and water may flow by gravity through long launders or troughs directly to their point of deposit in the lake. The Calumet & Hecla mill is, however, located on comparatively low ground adjoining Torch lake. The mill has already distributed sands over an area of 100 acres or so where the water was originally 100 feet to 120 feet in depth. The refuse sands from crushed rock amounts annually to something like 1,500,000 cubic yards. For several years the sand and water have been elevated about 50 feet by two great sand wheels. The wheels, 54 feet in diameter, are now being replaced or supplemented by a new wheel, 65 feet in diameter and having 10-foot face. On the center line of the periphery are gear teeth of 24-inch face and 4 7/8-inch pitch. A pinion 37 inches in diameter, with one additional reduction and a 750 H. P. motor, drives the great wheel, at about four revolutions per minute. On the inner side of the rim of the wheel are buckets, which are filled at the bottom of the wheel with sand and water. As the wheel revolves, sand and water are discharged at the top in launders which run out to the lake. In the early days miners looked for mass copper, and one great mass of 500 tons was found. They paid little attention to stamp copper. The first stamp mills were small, crude affairs, using a few of the old-fashioned Cornish or gravity stamps, such as are now in use in the Western gold mines. These were replaced later by Ball steam stamps, having at first only a small daily capacity. These have been developed within the last few years by Milwaukee manufacturers to a daily capacity of 500 tons or more of rock. The steam cylinders are now made 20 inches in diameter, using steam at 110 pounds pressure. The piston stamp shaft and wearing shoe weigh about three tons and make 95 to 105 blows per minute. The stamp shaft is attached to the lower end of the piston rod, is 8 inches in diameter and about 9 feet long. Its bottom is fitted with a chilled cast iron shoe, about 12 inches wide, 16 inches long, 18 inches thick and weighing, perhaps, 650 to 700 pounds. In conglomerate rock a stamp shoe is worn out in about three days. In the softer amygdaloid rock they last about three weeks.

As now constructed, the cast iron anvil upon which the rock is broken weighs from 90 to 120 tons. The anvil and frame of the stamps are supported on a concrete and timber foundation resting on solid rock. This concrete and timber foundation is usually 10 to 15 feet thick and 20 feet square and has anchor rods built into it. So necessary is it to have a solid foundation for stamps that at the Isle Royale mill, where there is a great depth of sand, steel cylinders filled with concrete were sunk 75 feet to solid rock. In the matter of stamp foundations one curious idea seems to have survived an unusually long time. In the early days the iron stamp shafts for gravity stamps were found to break quite often. Experience seemed to show that the metal crystallized when the stamps pounded against anvils resting on solid rock. It therefore became the custom to put in so-called spring timbers—that is, heavy wooden beams supported at each end and having the anvil in the center so as to give a resilient support, something like the lapstone on a cobbler's knee. When steam stamps were introduced, very heavy spring timbers were put in in the same manner, and, indeed, some of them are still in use. A little later it became the custom to put in several layers of 12x12 timbers in this foundation directly under the stamp and anvil. In fact, within the last ten years, the question of whether it would be safe to put in a solid steel foundation was warmly argued, and all superintendents of new mills, with the exception of two, put some timber under the anvils of new stamps which they were installing. At the new Baltic and Wolverine mills solid concrete foundations have, however, been in use several months, proving that modern steel will stand pretty hard usage before suffering destruction through

*Trans. Jour. West. Soc. Engrs., condensed.

crystallization. I have merely cited these facts as a curious example of how an erroneous idea may persist through forty years, and probably cost money all the time, because no one dared sooner refute the accepted theory by actual experiment.

Modern Slimes Plant.

Written for the MINING AND SCIENTIFIC PRESS.

At the Confidence mine, in Tuolumne county, Cal., of which N. Carmichael is superintendent, there is at present in operation a slimes plant constructed with radical changes in regard to tanks, which can not fail to be of interest to mine operators, as the works dif-

to the site of the cyanide works, some distance below; here they pass through hydraulic classifiers and are separated into two products, viz., sands and slimes. After making a number of tests, it was decided that about 30% of the slimes could be treated satisfactorily with the sands, and separation was effected accordingly. The balance of the slimes—about 25% to 30% of the tailings—are treated separately, as described further on. The sands are conveyed from the classifiers to leaching vats, 30 feet in diameter by 5 feet deep, two vats being loaded together, alternately receiving sands and drawing off battery water, and while one set of two vats are loading the other four are undergoing treatment. By this arrangement a six days' treatment can be given.

The tanks are loaded by a Pacific Tank Company's

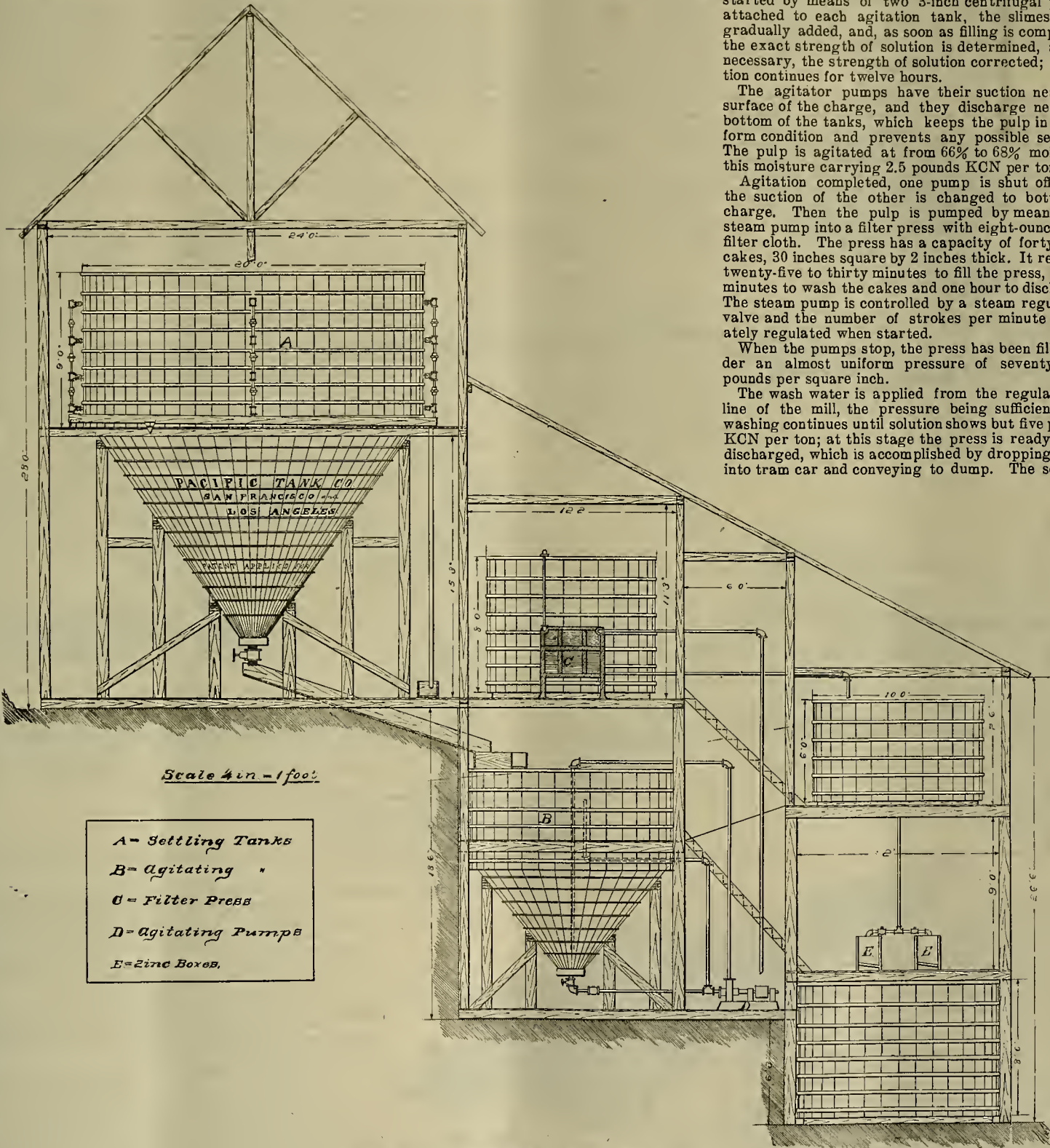
ization being sufficient to flocculate and settle the charge in seven hours; when completely settled, the water is decanted by means of four sets of 2-inch valves running spirally around the tank, each set lowering the water about 18 inches. In this way the decantation is conducted with least possible movement to body of water, no values whatever being carried away. The remaining slimes carry about 40% of moisture, and in this condition the slimes are discharged through an 8-inch gate valve, placed at the lowest point of the settling tank, into a flume leading to the agitating tanks. The agitating tanks are 12 feet diameter, with 8-foot staves and 6 feet depth of cone-shaped bottom, the bottoms sloping 45°. Before the slimes are run into the agitating tanks a certain amount of cyanide solution is run in and agitation started by means of two 3-inch centrifugal pumps attached to each agitation tank, the slimes being gradually added, and, as soon as filling is completed, the exact strength of solution is determined, and, if necessary, the strength of solution corrected; agitation continues for twelve hours.

The agitator pumps have their suction near the surface of the charge, and they discharge near the bottom of the tanks, which keeps the pulp in a uniform condition and prevents any possible settling. The pulp is agitated at from 66% to 68% moisture, this moisture carrying 2.5 pounds KCN per ton.

Agitation completed, one pump is shut off while the suction of the other is changed to bottom of charge. Then the pulp is pumped by means of a steam pump into a filter press with eight-ounce duck filter cloth. The press has a capacity of forty-eight cakes, 30 inches square by 2 inches thick. It requires twenty-five to thirty minutes to fill the press, thirty minutes to wash the cakes and one hour to discharge. The steam pump is controlled by a steam regulating valve and the number of strokes per minute accurately regulated when started.

When the pumps stop, the press has been filled under an almost uniform pressure of seventy-eight pounds per square inch.

The wash water is applied from the regular pipe line of the mill, the pressure being sufficient, and washing continues until solution shows but five pounds KCN per ton; at this stage the press is ready to be discharged, which is accomplished by dropping cakes into tram car and conveying to dump. The solution



Slimes Plant at Confidence Mine, Tuolumne County, Cal.

fer altogether from any other slimes plant now in operation.

The Confidence mine formerly operated a canvas plant, and the problem was how to save the values they were losing in their tailings, since these tailings carried from 50% to 60% slimes of high value.

It was decided to engage the services of A. S. Additon, who for a number of years has thoroughly investigated cyaniding in all its branches, and, after extended experimenting with the tailings, designed the plant now in operation. Acknowledgment is due Mr. Additon for furnishing the following description of the plant:

The tailings are conveyed from the mill in a flume

automatic distributor and are discharged through bottom-discharge doors by sluicing.

The slimes (mostly clay slimes that will pass a 120-mesh screen) are conveyed from classifiers by flume to three settling tanks, 20 feet in diameter, 9-foot vertical staves, beneath which is a cone-shaped bottom 14 feet deep (see drawing), the bottom sloping at an angle of 50°, each tank having a capacity sufficient to hold the separated slimes for eight hours' run of stamp mill. As soon as one settling tank is filled, the slimes are turned into the next one; lime is then added to the full tank by scattering it over the surface, the amount of lime being determined by accurate acid tests, the amount required for neutral-

recovered from the slimes in the press is pumped to the gold solution storage tank, and from there to the standard zinc boxes, where precipitation takes place in connection with filiform zinc.

The extraction of values from the slimes is 98% by this method, and 94% of the head value is recovered.

In the treatment of the sand by percolation 85% is saved, making the total value a very satisfactory saving on a difficult product. The actual cost for treatment does not exceed 85 to 90 cents per ton.

The wooden tanks used in this plant were furnished by the Pacific Tank Company of San Francisco, Cal., who are the sole manufacturers of conical-bottom redwood tanks, having patented this feature. Pre-

vicious to the erection of this plant, the Confidence mine made a good saving from their tailings with a canvas plant, and impounded their tailings after passing over the canvas plant. These accumulated tailings still retaining some values, a tailings plant of 100-ton daily capacity was designed and put in operation by A. S. Additon, who leached 10,000 tons last season with satisfactory results. Owing to a very large percentage of slimes in these tailings, it is impossible to work these during the winter months; but their treatment will continue next summer, and it will require several seasons to clean up this dump; meanwhile the canvas plant has been discontinued and the present plant is taking everything direct from the mill. The successful treatment of slimes has always been a problem confronting cyanide workers, and it is pleasing to note the success of this plant in California.

Hydraulicling Under Artificial Pressure.

The placer miner frequently locates gravel deposits which would pay to hydraulic, but where sufficient elevation is not obtainable to give the required water pressure. The accompanying diagram shows an arrangement which John A. Yeatman & Co., hydraulic engineers, of No. 13 First street, San Francisco, Cal., are putting in operation in Califor-

The Permanganate Process.

To THE EDITOR:—I have carefully read Mr. Stow's article in which he takes exception to some statements that I made in my description of the permanganate process.

In April, 1901, my first tests were made with Dr. Black's process. In August, 1901, I could apply it successfully and at a cost of 30 cents per ton of ore treated for chemicals. That statement can not be taken in any other way. I had not yet applied the process on a large scale, and I had no idea where my first work would be; hence I could not add the freight to my estimate.

In November, 1902, I made a practical run and gave the cost of working at \$2 per ton, which included cost of tailings.

I gave no details; but, in order to put Mr. Stow right, I will add that the total cost of chemicals was 56 cents per ton of tailings delivered at Sierra City. As to the average value of these tailings, I give in detail the first series of practical tests made:

Sept. 21, 1902, five tons of tailings from oldest part of the dump, charged into Tank No. 1, washed and treated with 500 gallons of solution:

Assay value of heads.....	\$14 47
" " of tailings	7 20
Extraction.....	\$7 27
Total recovery of gold after precipitation.....	\$34 80

reasoning is faulty. He recovers \$9.30 gold from material assaying \$18.60, which is 50%. I recover \$6.10 gold from material averaging \$12.20, which is 50%. Yet Mr. Stow claims a greater extraction by 52%.

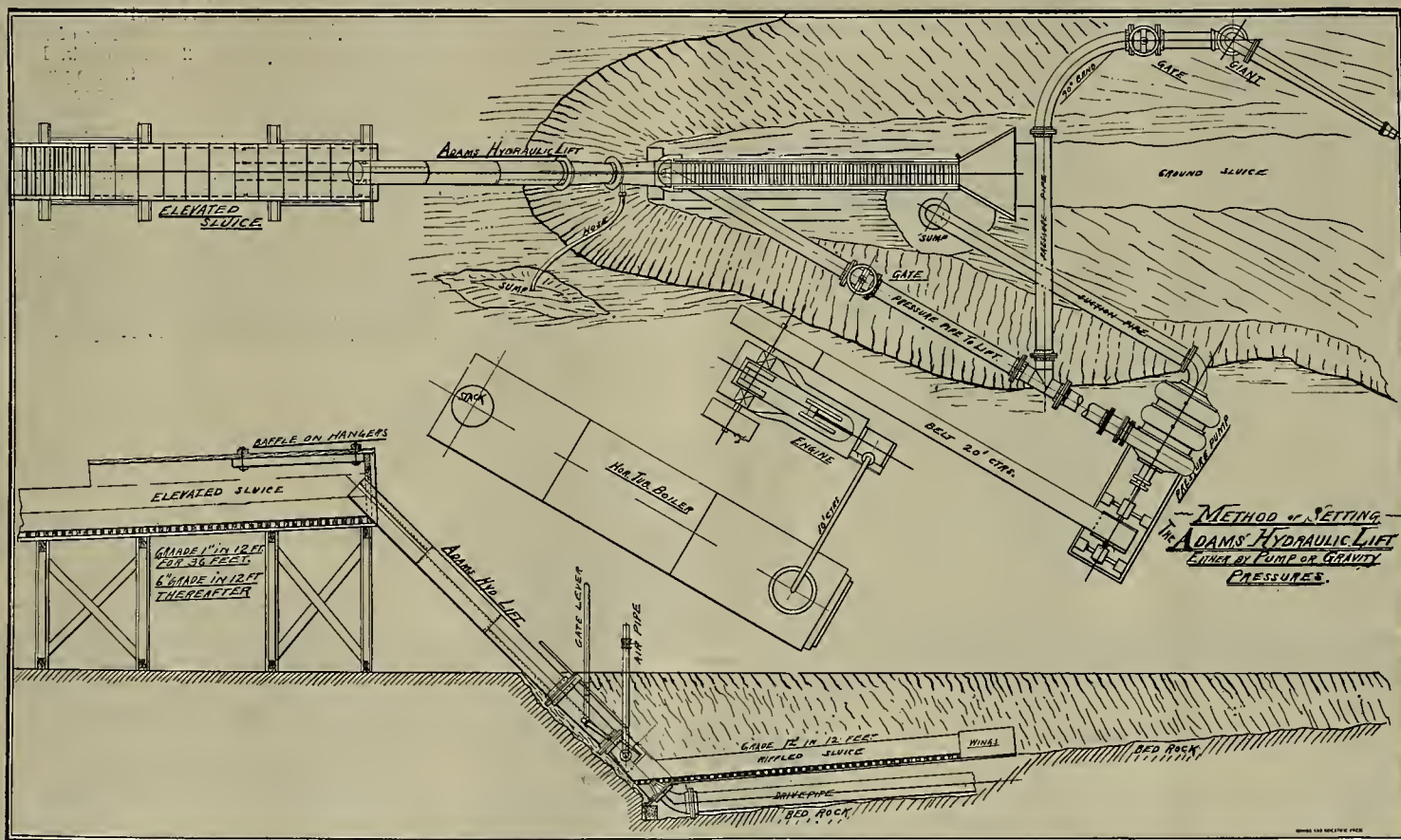
Mr. Stow's recovery of 1.55 ounce of silver is economically impracticable at the present price of silver.

The amount of gold extracted from the tailings by the silver leach is not an advantage, because the same would appear any way by chlorination. If Mr. Stow's silver leach took out gold that chlorination would not effect, then the silver leach would be advantageous.

As to Mr. Stow's application of barrel chlorination, I have this to say:

T. N. Smith, the chlorination expert, at present superintendent of E. C. Voorhies' chlorination works at Sutter Creek, Cal., and myself made many tests by the harrel process and succeeded in making a 50% recovery. We recognized and agreed that the barrel process applied to chlorination tailings would prove successful where the amount of tailings was sufficiently large to warrant the erection of a barrel plant.

My experiments have taught me to draw my conclusions as to the forms in which the gold exists in chlorination tailings, just as I stated in my first paper, and the values at present existing in the old tailings, without one word from me, shows that the operations



nia and in Alaska. Pressure is obtained, if a sufficient quantity of water is available, by a series, pressure, high-head, three-step centrifugal pump. This furnishes pressure for both the giant and the gravel elevator. The 6-inch pump is designed to give the equivalent of 250 feet head, but gives the best results operating at 180 to 200 feet head. The horse power required to run it is 62 when handling 75 miner's inches, and 82 H. P. for 100 inches. With the gates on the branch pipes, the giant and the elevator may be operated singly or simultaneously. The Adams hydraulic lift takes care of the tailings—this requires 5 feet head of pressure water for each 1 foot of lift (i. e., to elevate 20 feet will require a 100-foot head). The lift has a removable throat of sheet steel which takes the wear and is easily and quickly replaced. Two sizes of nozzles are used. The opening is controlled by a sliding door—regulating the size of houlders admitted. One of its features is an air vent, opening into the side of the throat (see lower part of diagram). By this, in case the lift becomes submerged, air is admitted and the column of water and gravel in the pipe readily started upward. By attaching a hose to this air vent, small sumps and pot holes may be pumped out. The elevator is built of sheet steel and in sections, so that it can be readily transported by pack animals. The series, centrifugal pump is also built in sections.

The discovery of gold is reported at Arltunga, in the northern part of South Australia. The new district is reported to have produced rich quartz specimens. The mines are about 1000 miles north of Adelaide.

Or \$6.96 per ton. Solution then run into the copper tank.

Oct. 1, 1902, a similar test made on tailings nearest old works:

Heads.....	\$9 20
Tails.....	4 10
Total recovery from 5 tons.....	24 60

Or \$4.82 per ton. Solution run to copper tank.

Oct. 9, 1902, a third test was made on tailings taken from all over the pile:

Heads.....	\$12 60
Tails.....	7 20
Total recovery from 5 tons.....	28 00

A summary of the three tests is as follows:

15 tons of tailings, total assay value.....	\$181 35
15 tons of tailings yielded in gold.....	87 40
10 pounds copper residue, @ 60c.....	6 00
Total gold recovery.....	93 40

There is a discrepancy between my assaying and recovery, in that the total value by heads assays was \$181.35, while my tailing assays, plus the total recovery, shows \$185.90; but the most careful work was done on these tests; and, as a whole, the work was as accurate as possible.

We have had many tanks as low as \$8.20 and a few as high as \$18.60; but the average has been about \$12.20, and our recovery has averaged 50% on rich and poor. I must say that my work here is a far better basis on which to figure the average value of the tailings as a whole, based as it is on a great number of assays, than Mr. Stow's one sample sent to him, from which he estimates the value of these tailings at \$18.60.

A comparison of results shows that Mr. Stow's

at the old plants were faulty. But it must be remembered that the men who operated these plants were the pioneers in chlorination and had to depend upon inexperienced roasters and generator men and had to work concentrates that were far from clean. Today we have the advantage of experienced men, cleaner concentrates, better furnaces, and, where oil can be used, a far better fuel.

With oil as a fuel, the roasted product from a furnace is far superior to the product of a furnace where wood is used, and the values left in the tailings are consequently much lower.

Without making any comparison with harrel chlorination, I believe, from my own tests, that the permanganate process is superior in many respects to the ordinary vat chlorination.

In conclusion, I should like Mr. Stow to suggest a better method of treating a small pile (800 tons) of chlorination tailings 47 miles from the railroad, and would like to ask why Mr. Stow did not work these tailings if he could make a recovery of \$9.30 in gold and 1.15 ounce of silver per ton? These tailings have been for sale for a number of years.

D. F. MEKLEJOHN.

Tailings at Ely, Nevada.

To THE EDITOR:—L. F. Shepard of Ely, Nevada, quotes some results on samples obtained from the tailings dump of the Chainman mine.

Mr. Corning's samples of the dump, as far as the writer remembers, averaged \$2.80 per ton.

These were taken over the slope of the dump and represent the last tanks discharged, among which

were the two quoted as being run without lime and averaging \$2.11 per ton, and, considering the fact of the occurrence in this ore of occasional specks of free gold, may be taken as a practical check.

The high sample taken from the tank was taken from the face of four boles dug in the tank at the time of draining, when the ore contained not less than 40% of moisture, and may clearly be considered as due to superficial enrichment on the surface by evaporation, a condition the writer called attention to in his first article.

In the company's prospectus appeared a statement to the effect that "there was in the mine more than 100 000 tons of 'ore in sight,' of an average value exceeding \$11 per ton."

In view of the fact that this statement was based very largely upon the report of Mr. Shepard, the (at that time) general superintendent of the property in question, a word to the wise should be all sufficient.

WINTHROP H. WICKHAM.

The Chemistry of Ore Deposition.*

By W. P. JENNEY, E. M., Salt Lake City, Utah.

At Silver Reef, Utah, silver has been deposited in lignitic sandstones, determined by Newberry to be of Triassic age. The mines since 1885 have only been worked by lessees in a small way. During the height of production in 1877-79 the total output was 2 122,471 ounces of silver. The ore-bearing beds were 30 to 40 feet in thickness, of which usually only 16 feet was pay ore. The ore occurred in flat shoots that were, in some places, 300 feet wide, and extended 400 to 500 feet deep on the dip of the formation. The ore was richest near the outcrop, and, as it was followed in depth, gradually got poor. Near the surface the silver was in the form of chloride, associated in places with the blue and green carbonates of copper in very small quantity. As the ore was followed in depth, the chloride gave place to silver sulphide, and scales of native silver came in, especially in the branches of trees and distributed in the plant shales. No other ores were found, and the gangue minerals usually occurring in ore deposits, as quartz, calcite, barite, etc., were absent. When, following the inclination of the strata, the workings attained a vertical depth of 400 to 500 feet, the ore changed, becoming low-grade and difficult to amalgamate in pans, the ore shoots at the same time contracted, becoming narrow, and only 2 or 3 feet in height. Exploration was continued for several years, but finally all search in depth for pay ore was abandoned.

Many writers report that traces of silver and copper occur in the extension of these same sandstone reefs, which can be traced by their outcrop for a distance of 10 to 20 miles to the southwest. An unknown author, in the early development of the district (May, 1877), thus describes the peculiar occurrence of the ore: "The formation is a beautifully stratified red and white sandstone, but greatly broken up and eroded. Where the strata have been undisturbed they rise to a height of perhaps 1000 feet above the adjacent valley, in table mountains, alternately banded in red and white, and plainly showing the former height of the whole country. The numerous extinct volcanoes and vast quantities of volcanic rock found throughout southern Utah, and particularly this section, point to at least one agent, and no doubt a powerful one, which served to produce the numerous foldings and contortions of the strata, while the great sandy deserts, covered with sage and cactus, bear abundant evidence to the erosion. On the northern side of what was once a vast basin, lying between several ranges of high mountains of old rock, where the erosion of an anticlinal has left ridges of reefs cropping out at various angles, are situated the mines. * * * The sandstone consists of red and white deposits, carrying some lime as cementing material, with occasional layers of clayey or sandy rock, and considerable carbon scattered throughout. This carbon, which is evidently from the decomposition of drift material, of which the impression in the rock and even the plant itself is yet distinct, occurs in important layers in places. * * * Petrifications are not uncommon, some of which form a valuable ore. The white sandstone, which appears to have been of a somewhat finer texture than the red, seems, so far, to have carried the ore. * * * These veins, as they are called, are entirely conformable with the strata, and in no case do they cut across the adjacent layers of rock. They appear to be richest where there is the most carbon, which evidently has acted as a reagent to precipitate the silver from solution and to deposit it sometimes as flakes of metallic silver. In some cases the form of the plant, of apparently a reedy nature, is yet distinct, in which the cells are yet visible, but to a great extent filled with valuable ore. Other beds carry considerable copper in the form of blue or green carbonate, and also iron in nodules which run very high in silver. * * * A light sandstone, containing streaks or fine layers of a dark material, which elsewhere would not attract attention, is there found, sometimes, to run from \$50 to \$100 a ton, while the darker rock, containing considerable carbon, cop-

per or iron nodules, will at times run into the hundreds, or even thousands."

W. M. Nesbit, who was connected with mining operations at Silver Reef from 1878 to 1888, gives the author the following statement of the manner of occurrence of the ore: In the Barbee & Walker mine water was struck at a depth of about 500 feet vertically. Near that point the ore changed in appearance and character, and gave great trouble in amalgamation, the extraction being very low. The ore was treated bot, in pans; a thick scum rose on the pans, like heavy petroleum oil, and had to be removed from time to time during the amalgamation. From a charge of 1½ ton of ore as much as a gallon of this oily material would be obtained. The ore at water level, if carefully stoped, averaged 12 to 16 ounces of silver per ton, but only a part of the silver could be saved in the pans. A very little pyrite appeared at water level—the first seen in the mines. About 100 to 200 feet above water level, on the slope of the beds, the ore was in places very rich, and small bunches of lignite coal, 4 to 10 inches across, were found imbedded in the soft sandstone, with native silver deposited in thin scales on the joints of the coal. Most of the ore at this depth was silver sulphide. At one place a tree trunk, 18 inches in diameter, was found. The heart wood was silicified and very hard, and carried 8 to 10 ounces of silver per ton. The sap wood and bark, 3 to 6 inches in thickness, were altered to soft, crumbling lignite, full of silver sulphide. It assayed 5000 ounces of silver per ton. The ores from the Silver Reef mines never showed any gold by assay, but in leaching the ore by the Russell process the silver sulphides produced contained a trace of gold.

Light is thrown on the change in the mineral character of the ore at water level, and on the difficulty experienced in amalgamation, by the discovery that the ores carried selenium, the average of four analyses giving 0.23% selenium and 0.26% silver. The selenium in one specimen amounted to 90 ounces per ton.

The structure at Silver Reef may be stated as a broad anticlinal arch, broken up by faults coursing northerly and southerly, rudely parallel to the axis of the fold. A basin, nearly 3 miles across, occupied by the valley of the Virgin river, was eroded through the crest of the arch, leaving the two cliffs facing one another, the strata dipping away from the basin on the two sides. The total area of the several ore-producing belts of sandstone outcrop, left by erosion, covered less than 500 acres.

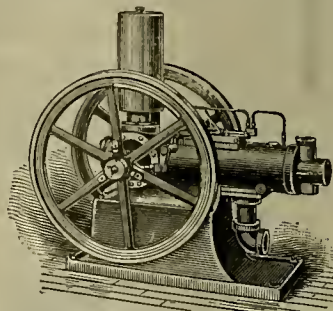
Silver Reef conforms to the general law of areal distribution of mining districts, namely, that "ore deposits have been formed only in local areas of disturbance. Between and surrounding such areas of mineralization extend broad, barren tracts of undisturbed strata," and also conform to the law of mineral occurrence, namely, that "all workable deposits of ore occur in direct association with faulting fissures traversing the strata, and with masses of crushed and shattered rock, produced by movements of disturbance. The undisturbed rocks are everywhere barren of ore." The descriptions apply to a mineral area which, prior to the recent erosion of the basin, may have possibly covered 4 or 5 square miles, with pay ore found in no place outside this special area.

A writer notes that only the fractured, jointed and permeable portions of the bed are rich; where undisturbed and massive, the sandstone is barren. Also that vertical fault planes frequently bound the ore. These are conditions that are found in impregnated beds of zinc and lead ores in southwest Missouri and northern Arkansas, and also in the flat deposits of gold, associated with tellurium, in the

fissures. It appears that secondary enrichment has taken place on an extensive scale, and that the silver was deposited originally in the sandstone in combination with selenium and probably with sulphur by the reducing action of the lignitic matter. Afterwards these primary ore bodies were enriched by the secondary precipitation of silver sulphides, by the agency of descending surface waters, aided greatly by the progressive erosion of the basin.

The Mietz & Weiss Kerosene Engine.

This engine, the general appearance of which may be seen from the accompanying illustration, is manufactured by Aug. Mietz, 128-132 Mott St. and 87 Elizabeth St., New York City, and is claimed to be among the very best apparatus of its kind in the world. It is said to embody all features necessary for the production, with perfect reliability, of the maximum of power with the smallest consumption of gas or kerosene. The drawbacks and defects ex-

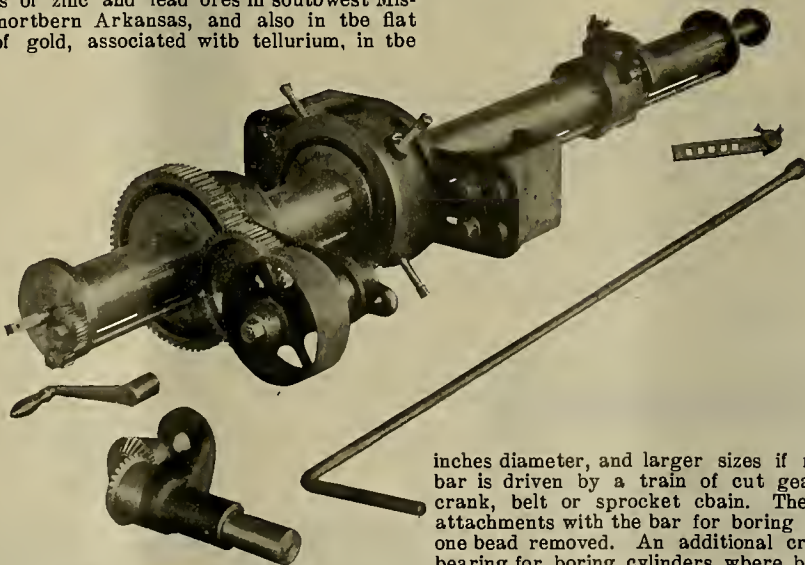


Mietz & Weiss Kerosene Engine.

perienced in other engines are claimed to have been avoided in this type and many improvements added. On account of its simplicity, this engine is particularly adapted for the use of common kerosene or lamp oil (50° test), and when so arranged, it is absolutely the safest and simplest power-producing machine conceivable. A catalogue giving more definite information in regard to this engine will be sent by Mr. Mietz to anyone who is interested in the subject.

New Portable Cylinder Boring Bar.

The accompanying illustration shows a new portable cylinder boring bar, designed for reboring all makes and sizes of steam engine cylinders, pump cylinders, gas engine cylinders, air compressors, blowing engines, mining and hoisting engines, Corliss engines, hydraulic cylinders, etc. The bar is made of a hollow steel tube accurately turned and ground to size; the tool head is so arranged that the tool can be fed out and the back counter bore of a cylinder can be rebored without changing the bearings of the bar. It is easy to face a joint or flange of the cylinder without putting any cumbersome attachments on the bar; this will be found very convenient on pump repairs. The feed gears and screw are made of steel and the feed nut of the best bronze. There is also a right-angle drive that can be used in boring vertical cylinders, and also in boring horizontal cylinders where the side of the cylinder is too close to the wall of the building. These bars are made in all sizes to bore cylinders from the smallest up to 72



New Portable Cylinder Boring Bar.

Cambrian sandstone near Deadwood, South Dakota.

Selenium usually occurs with minerals believed to have been formed by highly heated vapors and solutions and in direct association with igneous disturbances. Its presence at Silver Reef seems to favor the theory of the deposition of the silver through the

inches diameter, and larger sizes if required. The bar is driven by a train of cut gears, either by crank, belt or sprocket chain. The cut shows all attachments with the bar for boring cylinders with one bead removed. An additional cross plate and bearing for boring cylinders where both heads are removed is furnished. Each bar has two tool holders with two self-bardening steel tools. These bars are manufactured by Hugh Mathews, Kansas City, Mo.

THE discovery of a new district in which native copper occurs is reported in Canada about 300 miles north of the copper mines in Michigan, on Keweenaw point.

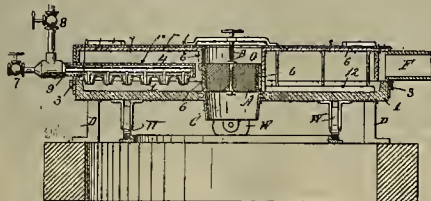
*Trans. Am. Inst. Min. Engs.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 24, 1903.

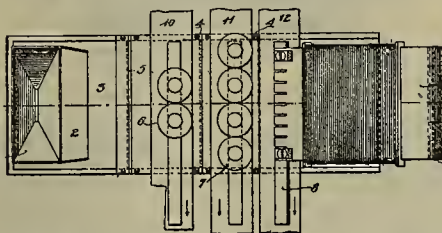
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METALLURGICAL AND CHEMICAL FURNACE.—No. 723,251; C. A. Doremus, New York, N. Y.



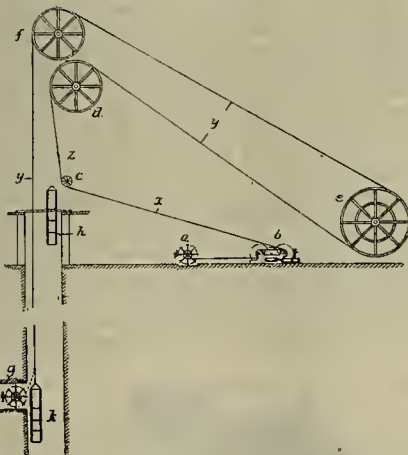
Furnace which consists of horizontally rotating covered hearth, on which materials to be treated are spread, burners placed radially within furnace and extending over surface of hearth in such position as to project flames issuing from them upon hearth.

PROCESS OF CONCENTRATING ORES.—No. 723,362; H. F. Campbell, Melrose, Mass.



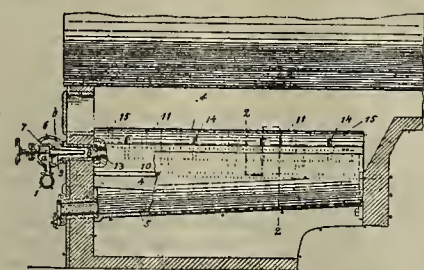
Process of concentrating ores to remove definite proportion of constituents capable of being rendered paramagnetic, consisting in heating ores to render constituents paramagnetic and passing same through magnetic field of strength inversely proportioned to degree of exposure to heat.

APPARATUS FOR CHANGING WINDING ROPES IN MINES.—No. 723,437; A. Beien, Herne, Germany.



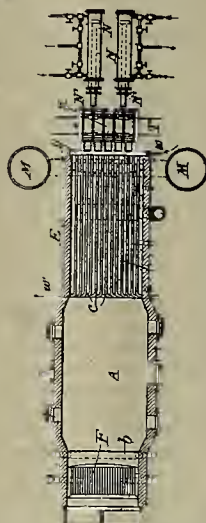
Combination of winding reel a upon which substitute rope is wound, friction-gear steam crane b provided with two drums around which substitute rope passes from reel a in single convolutions side by side, rope wheel c under which substitute rope passes to be temporarily connected to rope to be replaced, driving wheel e and rope wheels d, f, for driving and guiding rope, and reel g upon which rope to be replaced is wound.

FURNACE FOR LIQUID FUEL.—No. 723,564; A. Wengenroth, West Hoboken, N. J.



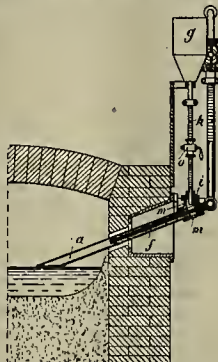
Conduit for liquid fuel, composed of troughlike base having semicircular depression in upper face and top piece fitting into base, having longitudinal groove approximately in center, of transverse grooves at intervals, perforations communicating with longitudinal groove.

MELTING FURNACE.—No. 723,443; F. H. Daniels, Worcester, Mass.



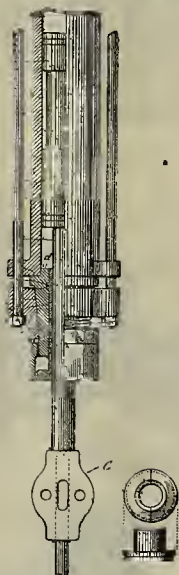
Furnace comprising firebox, main chamber, floor forming melting basin, with facilities for drawing melted metal therefrom, preheating chamber or annex extending from basin toward exit flue, having floor overlaid with water pipe for supporting materials charged, pipes being arranged to permit feeding of miscellaneous scrap, feed door at outer end thereof, stock car and tramway adjacent to feed door, mechanical charger disposed opposite feed door adapted for transferring carload of material from stock car into preheating furnace chamber.

TREATING COPPER ORES AND ORES OF COPPER AND NICKEL.—No. 723,500; H. C. Thofehn, Paris, France, and B. de Saint Seine, Widnes, England.



Treatment of copper ore, matte of copper and raw copper in reverberatory furnace, consisting in blowing into furnace on surface of bath mixture of superheated steam and air carrying silica and lime.

PACKING DEVICE FOR DRILL RODS OR THE LIKE.—No. 723,740; B. Selfridge, Butte, Mont.



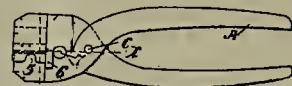
Longitudinally split bonnet, means for attaching bonnet to cylinder of drilling machine, longitudinally split sleeve in bonnet and forming along length, surface closely embracing piston, stuffing-box on bonnet, stuffing-box having longitudinally split gland, inner end of bonnet being spaced from outer end of sleeve to receive packing between them.

PROCESS OF EXTRACTING METALS FROM ORES.—No. 723,787; S. Trivick, Clapham, England.

Process evolving nascent chlorine and effecting

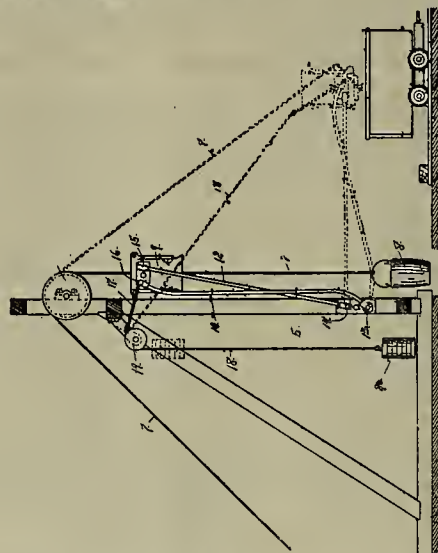
chlorination of metallic substances that may be extracted from metalliferous mass by rendering them solvent, consisting in adding to mass mixture of dry chloride of lime and a metallic salt, proportions being such as to result in formation of hypochlorite of metal of added salt and chloride of metal which will evolve nascent chlorine.

FUSE SPLITTER AND CAP CRIMPER.—No. 723,520; J. Fischler, Silverton, Colo.



Fuse splitting device consisting of pivoted handles, blade carried by extension of one of the handles, jaw carried by other, elastic plates fixed to jaw, separable blocks carried by plates and guides extending above blocks, stop at inner end of splitting block, against which fuse abuts when being split.

BUCKET DUMPING APPARATUS.—No. 723,771; T. E. Anderson, Denver, Colo.



Combination with suitable frame, of bucket holder, counterbalance normally holding holder in elevated position and in path of bucket to be dumped, means connected with bucket holder for supporting latter in operative position on frame and adapted to invert holder and bucket as they are carried downwardly by gravity of load which overcomes counterbalance.

Southern California Enterprise.

TO THE EDITOR:—The city of Santa Barbara, Cal., will increase its domestic water supply by the completion of a tunnel beneath the Santa Ynez range of mountains, near that city, and the construction of a storage reservoir in the basin of that river. The total length of the tunnel would be over 19,000 feet. About 5000 feet of this has been constructed in small contracts of from 500 to 1000 feet at a time. It is now proposed that the city should vote bonds for the completion of this tunnel, letting all the remaining portion of the tunnel in one contract. The tunnel will be approximately 5x7 feet, run in a sandstone and shale rock from both headings, but without any intermediate shafts. It will call for mechanical devices for handling the material out of the tunnel, and also for effective air compressing machinery.

The bond election has been called in Santa Barbara, and there seems to be little opposition to its passage. Bids will then be called for for the completion of this tunnel. The building of the storage reservoir will follow the completion of the tunnel.

I give you this information as the city would be glad to have contractors who read your publication bid on the work.

Communications may be sent in this connection to E. S. Sheffield, Chairman Board of Water Commissioners, Santa Barbara. J. B. LIPPINCOTT, Los Angeles, March 28. Consulting Engineer.

The bond election carried by a large majority, and the work will go on.—ED.

Sound travels faster in a heated atmosphere than in a cold one. At 30° F. below zero sound travels 1030 feet in one second, at 60° above zero at 1120 feet, and at 120° F. 1180 feet per second. Sound travels faster through a denser than through a rarer medium. The distance that sound may be heard through solid rock in mines varies greatly, depending upon the character of the sound and the kind of rock. If there are zones of soft ground these tend to deaden the sound. The strokes of a machine drill may be heard through 300 to 400 feet of hard rock, and possibly further. Blasting can be heard from 1000 feet to 1500 feet, and in some cases at a still greater distance.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

At least ten companies or private concerns will have drilling outfits at work in Alaska before June 1, says the Pacific Oil Reporter. There are three principal oil districts—Cold Bay, Cook's Inlet and Kyak.

ARIZONA.

COCHISE COUNTY.

P. G. Sawyer of Kansas City, Mo., and E. Smith of Douglas, directors of a company of Douglas and Kansas City men, operating near Douglas, say a 10-stamp mill and other machinery will be put in this spring. The mine is in the Pineta mountains and shows free milling gold ore.

The Bisbee Superior Development Co. has incorporated at Houghton, Mich., to develop a group of claims 4 miles north of Bisbee. Superintendent Wilcox of the Mass mine at Mass City, Mich., is a director.

The Burns group of copper mines, 25 miles from San Simon, are reported sold, and J. H. Knowles of Solomonville is superintendent.

GILA COUNTY.

The report of the Old Dominion M. Co., at Globe, for the year ending Dec. 31, 1902, shows the production of refined copper to be 7,992,550 pounds, as against 10,094,787 pounds in 1901. It is expected when the improvements in the plant are completed the production will be at the rate of 20,000,000 pounds of refined copper per annum, says the Citizen.

Finletter & Harvey are shipping ore to the smelter from their Keystone mine, near Oak Spring, near Globe. The ore averages 20% copper, says the Silver Belt.

W. Pobl and H. T. Wendleborn, who have a lease on the Big Johnny mine, near Globe, are delivering ore at the smelter. The ore runs 20% copper and carries silver.

W. H. Mercer and J. A. Valentine of the Mercer Tunnel Co., operating at the head of Mineral creek, near Globe, say the tunnel is in 600 feet, and, to provide better air, a gasoline engine has been set up to run the blower. It is intended to put in power drills to hasten the work. The tunnel is in a low-grade sulphide for the greater part of its length.

GRAHAM COUNTY.

The Shannon Copper Co., at Metcalf, resumed the production of copper last week, says the Arizona Bulletin. The concentrating plant has been in operation for two weeks. During the construction of the concentrator work has been pushed in developing the ore bodies of the mine. The company owns a group of several claims near Metcalf.

MOHAVE COUNTY.

(Special Correspondence).—A gold discovery is reported in the Colorado river range, 9 miles west of Chloride. M. Dempsey and W. O'Dea, who made the original discovery, are sinking on their find with good results, the ore being worth \$150 a ton in gold. The pay shoot is about 5 inches wide, in a shaft down 8 feet. The gangue is lime spar. Work is being done by others on the same vein. Many locations have been made and a camp has been established in the new district.

In the Chloride district the S. Smith gold discovery on the Emerson mine is proving, with development, to be a bonanza. The discovery was made in sinking a shaft at water level, 70 feet from the surface, where a crosscut has developed 7 feet of ore. Assays run two and a half ounces gold to the ton. H. Shaefer of Los Angeles, Cal., is interested with Smith.

A gold strike, 3 miles east of Chloride, has been made by J. Flynn on the south extension of the Samoa.

The Philadelphia & Arizona M. Co. have put in a steam hoist at the three-compartment shaft on the Mother Lode mine. A body of gold, silver and copper ore is being developed. Water for the 225-ton concentrating plant at the Minnesota mine, 1/2 mile distant, will be supplied by this shaft.

The Elkhart mine has a large tonnage of milling ore in the mine and on the dump. The 100-ton mill is running on full time. The mine is producing less shipping ore than formerly.

The Altata, Redemption, Clyde and Samoa are also doing well and developing. It is reported that the 300-ton milling and cyaniding plant of the Gold Road Co. at Acme will be in operation by June 1. Development is being done in the mine.

The Queen Bee mine at Mineral Park,

under bond and lease to J. Deter, is producing high-grade silver ore, and a new steam hoist has recently been put in.

Chloride, March 31.

The Sheeptrail group of mines on the Colorado river, near Kingman, have been sold to the New Comstock M. Co., says the Searchlight. The sale includes a 20-stamp mill, cyanide plant, hoisting works, air compressors and power drills. It is intended to build a railroad from the mines to the mill, which is on the river, a distance of 6 miles. The mine is 10 miles north of the Gold Roads group. S. C. Bagg is manager.

A. B. Robbins is operating a 20-ton cyanide plant at the Cyclopic, in Gold Basin district, near Chloride, with H. Barnes superintendent. He has fifteen men at work developing the mine and is testing the ores. The Cyclopic is a blanket ledge 1 1/2 mile in length, 200 feet wide and 10 feet thick, the ore averaging \$8 in gold per ton.

SANTA CRUZ COUNTY.

The Santa Cruz M. Co. will put in a steam pump and a hoist at their mine near Nogales, and sink the shaft to 300 feet.

YAVAPAI COUNTY.

The Yeager Canyon Copper Co., near Jerome, has sunk its shaft 630 feet in the incline and ore is blocked out in several levels. It is said reduction works are contemplated.

G. W. Hull, president and manager of the Cleopatra C. Co., near Jerome, says he will increase development work on their group and a smelter is proposed.

Manager Parker of the Palo Alto group of copper and gold mines on Eugene gulch, near Prescott, says a mill of fifty tons daily capacity will be put in this spring.

The Hackberry mine, near Bighug, owned by the Treadwell M. Co., has men at work and the shaft has been unwatered. Ore is showing in the bottom.

The Ideal M. Co. has bonded the Blake mining group, on Groom creek, near Prescott, and will put in machinery and begin sinking a double-compartment shaft 100 feet deep. Later on they will put in a steam-power stamp mill. This company is operating the Canaris mine, 2 miles from the Last Chance, and last week shipped a carload of ore to the Sharpneck mill.

At the Gold Link mine, 18 miles from Hillside, in Santa Maria district, a 20-stamp mill and cyanide plant are being erected.

LOS ANGELES COUNTY.

The Whittier-Fillmore Oil Co., near Whittier, began pumping their first well last week, averaging 125 barrels a day. The hole is 2300 feet deep.

SISKIYOU COUNTY.

The Scott Valley Advance says Manager Hickey of the Hickey mine on White's gulch, near Etna, reports development work progressing. A 3-foot vein of gold quartz has been opened up, and he will probably put in a mill this spring.

CALIFORNIA.

AMADOR COUNTY.

G. W. Horn and G. S. Andrews have bought the Porteous mine, adjoining the Horn mine near Defender, for \$3000. A tunnel runs through the Porteous to the Horn claim.

J. J. Cranmer has bonded the Emmons mine at Pine Grove for two years at \$4000. Cranmer Bros. have been operating a 2-stamp mill on the Blakely mine on Elsie creek, which is thought to be on the same vein as the Emmons mine.

BUTTE COUNTY.

C. Faul and A. T. Haynes are erecting a 4-stamp quartz mill on their mine—the Jennie May—at Bidwell Bar, near Honeycut. They have 150 tons of quartz on the dump ready to mill, a former test run of which yielded \$13 a ton.

The Gold Bank mine, near Forbestown, has forty men at work and the mill and chlorination works are in operation.

The Miller mine, near Forbestown, will be reopened. The development consists of an inclined two-compartment shaft 200 feet deep, with a drift at the 150-foot level, 325 feet on the vein and 80 feet of crosscuts, a drain tunnel 1000 feet long connecting with the shaft at the 200-foot level, and 600 feet of tunnel on two veins.

CALAVERAS COUNTY.

The '49 Gold Placer M. Co., operating near Douglas Flat, is preparing for heavier operations this season. They have a three-compartment shaft down 60 feet, on which they are erecting a hoist and will put in two 14-inch plunger pumps. The hoist will be fitted for either steam or water power, the latter being used most of the time. J. M. Evans, superintendent, has twenty men at work.

The Crystal mine at Angels is down 500

feet and good rock is being found, says the Record.

EL DORADO COUNTY.

O. A. Ingraham has bought the McGraw & Peters 5-stamp mill and engine near Kelsey and will move them on to a prospect he is developing near El Dorado.

A hoist is being set up at the Eureka slate quarry at Kelsey to be used in connection with the air compressor.

INYO COUNTY.

The Reward mill, near Bishop, began work with ten stamps this week, and the other ten will be dropped next week. It is run by electricity, generated by the company's dynamo, says the Inyo Register.

KERN COUNTY.

T. O. Turner, manager of the Eastern Con. Oil Co., at Kern river, near Bakersfield, says his company will begin construction work next week on its refinery. The refinery will have a capacity of 1000 barrels a day—five stills of 200 barrels each. The company has eighty acres in the building site.

The Menona Oil Co. has incorporated to operate near Bakersfield, principal place of business San Francisco, with J. W. Anderson, W. W. Allen, Jr., M. Burns, C. E. Benson, C. O. Huber, directors.

J. M. Wright, president of the Peerless Oil Co., has leased several sections of oil land west of McKittrick.

The Yellow Aster M. Co., near Randsburg, has both its mills running steadily. A timber-framing machine will be added to the carpenter shop.

MONO COUNTY.

J. L. Wedekind, part owner of the Golden Gate mines, near Bodie, says they have incorporated under the name of the Wedekind G. M. & M. Co., and, as soon as the snow melts, will begin to erect a mill. The ore is free-milling, assaying \$35. A crosscut is being driven to tap the vein at a depth of 100 feet.

NEVADA COUNTY.

Underground operations began this week at the Slate Ledge mine at Forest Springs, near Grass Valley, owned by the New York-Grass Valley Co. Grading for the mill is finished, says Manager G. W. Root. The mill will have eighty tons daily capacity. A water power hoist has been put in.

At the Black Bear mine on Deer creek, near Nevada City, owned by D. B. Marwick, W. Torpie and C. Schroeder, a 3-foot vein of quartz carrying free gold and sulphides is reported opened up, and a stamp mill is proposed.

An additional air compressor capable of developing 300 H. P. is being set up at the power house of the North Star M. Co., near Grass Valley, says the Tidings. This will make a total capacity for the plant of 700 H. P. A. D. Foote is superintendent.

It is locally reported that the North Star M. Co. at Grass Valley is about to take over the holdings of the Gold Hill M. Co., of which R. Walker is superintendent.

The Allison Ranch mine, near Grass Valley, is reported by the local papers closed down and the pumps pulled.

The Ironclad mine, at Rough and Ready, E. Morgan superintendent, is running its 2-stamp mill steadily. Drifting and stoping are going ahead on the 200-foot level north, and the incline will be sunk deeper. It is believed the developments will warrant putting in a 10-stamp mill next summer. The company owning the Hudson, on Deer creek, will resume.

The Slate Ledge mine (the Perrin mine), at Forest Springs, near Grass Valley, is being reopened by the New York-Grass Valley Co. A. W. Culp is manager. The shaft is down 540 feet below the drain tunnel.

PLACER COUNTY.

The Blue Canyon M. & D. Co. at Blue Canyon will drive an additional 400 feet in the Azalla tunnel.

The Annie Laurie mine, 5 miles from Colfax and near the American river, has been sold to Manager Russell, says the Sentinel. He will begin development next week.

Five stamps are to be added to the mill of the Shady Run mine near Blue Canyon, of which R. A. Watson is superintendent.

The Fowler & Gallagher placer claims on the American river near Colfax are to be worked by a dredger, with F. B. Jackson, of Sacramento, superintendent.

SAN BERNARDINO COUNTY.

The Times-Index reports W. Slocum of Monrovia is preparing to erect a 5-stamp mill on his mines near Barstow.

SAN DIEGO COUNTY.

A strike of rich ore is reported in the Washington mine, near Julian. Ore is being taken out of the ledge of the Oroflamme mine at Banner.

SANTA BARBARA COUNTY.

It proposed at Lompoc to erect storage tanks near the beach and load the oil into vessels by means of rubber hose. From the wells to the sea is a sufficient difference in elevation to pipe the oil to the coast without the necessity of pumping.

SHASTA COUNTY.

Manager Keating of the Bully Hill mine at Winthrop, 13 miles from Redding, says the negotiations for a consolidation of the Bully Hill and Mount Shasta mines, that have been pending for several months, are off and that De Lamar will hereafter conduct his Bully Hill mines with his own company.

A strike has been made on the 570-foot level of the Bully Hill copper mine at De Lamar (Winthrop), says Superintendent Anchor. The ore body varies in width from 2 to 12 feet. At the smelter coke and fluxing materials are accumulating and the ore bins are being filled. Lime rock is being hauled from Grey Rocks, 5 miles distant.

At the Tamarack mine at Copper City, near Winthrop, owned by Wall & Meyer, 5 feet of copper ore has been opened up 100 feet from the surface in a tunnel which runs in at a depth lower than that reached by the main shaft.

At the Minnesota mine on Town Creek mountain, the owners, J. T. Wall and C. J. Teass, are doing development work.

SIERRA COUNTY.

(Special Correspondence).—M. D. Howell, who has the Grey Eagle mine, near Sierra City, under bond, has cut a ledge of free-milling rock in two crosscuts and has 12 feet of \$3 ore in the face of the main tunnel. Howell expects to develop the mine extensively. At the Keystone mine, near Sierra City, the vein was cut several weeks ago and has increased gradually in size until the face of the drift shows 5 feet of quartz. An Eastern company expects to open up the San Louis and Santa Zahina mines early in the spring.

Sierra City, March 28.

SISKIYOU COUNTY.

(Special Correspondence).—This is an excellent water season and everything is booming in placer and quartz mines. The Y. M. & M. Co. is in steady operation and will have a good season. A strike of ore in the Mountain Laurel mine shows rich sulphurets plentifully sprinkled with free gold. A sale of this property is pending. The new company expect to open up on a large scale.

At present there is a scarcity of good miners in this country. Men are put on as fast as they come along, but there are not enough to fill the bill.

A. J. Ball will put up a small mill this spring to work the ore already blocked out in his mine.

L. A. Carter of the Cliff Top mine is taking out good ore and expects a prosperous season. It is likely that the Fagundes mill at Rollin will be kept busy this spring and summer crushing custom ore.

Rollin, April 1.

H. Mattern will start up his quartz mill at Rocky gulch, near Hornbrook, as soon as wood can be obtained for making steam.

SONOMA COUNTY.

The Devil Creek M. Co. has incorporated at Healdsburg; A. Gintner, H. Graper, G. Seebaker, J. G. and F. W. Ortman.

TRINITY COUNTY.

J. H. Porter, superintendent of the Fairview mine near Minersville, says he has twenty-three men at work, and the mill is crushing 1000 tons of ore per month. The company intends to add ten stamps to the mill, which will be in operation by June 1st.

Near Dedrick, the tramway from the Jenny Lind group of mines to the mill, a distance of 1 1/2 mile, is completed. At the Chloride mine 130 men are at work and thirty stamps are dropping in the mill. R. A. Skinner, superintendent of the Glohe mine, started work this week. He will build a road from Dedrick to the hoarding house on Bear gulch. He has twenty men.

The Yellowstone G. M. Co. has been incorporated under the South Dakota laws to operate the Yellowstone mine on the east fork of North Fork Trinity river, near Coleridge; G. H. Gill, M. H. Gridley, F. C. Thomas, J. H. Gill of New York. Work has begun this week.

The Chonchilula Gold Reef M. Co. has been organized in New York to operate quartz claims in Chonchilula district, south of Douglas City. M. W. Musgrave, M. Manley, W. B. Heyburn, W. T. Wintemuts, P. M. Paulsen, S. T. Church and T. P. Estes are directors.

TUOLUMNE COUNTY.

B. B. Montgomery of Columbia last week bought a one-half interest in the

Nightingale quartz claim, 2 miles northwest of American Camp. J. G. Thoma of Arizona and A. W. Magel of Barmen, Germany, have bought the Temple gold quartz claim and the Barmen mine, near Sonora.

F. Foster and F. Berg are operating their 2-stamp mill on the Miner's Dream, near Groveland, which is run by a windmill. When the wind falls horse power is used, says the Carters New Era.

A double cylinder hoisting engine has been set up at the 700-foot station in the Harvard mine, near Jamestown, and sinking in No. 1 shaft resumed from that level to go down 200 feet.

W. S. Estey has bought the deep river gravel diggings of J. Woodside & Co.—the Wat Clark claim—in Springfield precinct, near Columbia, for \$75,000, says the Magnet. The pay channel has been opened up 50 feet wide and 6 feet deep.

The Cosmopolite mine, near Groveland, was sold last week to J. M. Merrill, who held a bond on it.

J. M. Meighan has begun operations at the Bourne mine, near Groveland, on the Divide, between the Cosmopolite and the Canonous mines. There is a shaft down 85 feet and a drift 110 feet. A new shaft will be sunk.

The Mexican group of mines near Groveland has been bonded to E. C. Hahn of Stockton. There is a shaft down 100 feet, the bottom showing a vein 4 feet wide of rock which mills \$7 per ton.

The Santa Ysabel Co., operating on the south end of Quartz Mt., near Stent, has reorganized as the Santa Ysabel M. Co. of Phoenix, Ariz. Directors—F. Tent, J. F. Macdonald, C. M. Flint, A. N. Parlin, S. Rothschild, R. C. Hayward, H. E. McIntyre, E. C. Loftus is superintendent.

The John Royal M. Co. has incorporated to work the John Royal mine, near Columbia. G. Christ, Jr., and A. G. Stark of Phoenix, Ariz., are directors and W. A. Holmes superintendent, says the Magnet.

YUBA COUNTY.

It is reported that a company of New York men, C. R. Hill manager, have bought placer ground covering 6 miles in length along both sides of the Yuba river below the restraining dam being built by the Government near Marysville. It is proposed to put in five dredgers to work this ground.

COLORADO.

ARAPAHOE COUNTY.

Operations are resumed by the Union Ore Extraction & Reduction Co. at Denver, having rebuilt their plant destroyed by fire last fall. Although not in full blast, they are treating thirty tons of copper-bearing ore daily, employing the Gardner process of extraction by leaching with sulphuric and other acids, says the Denver Post. P. W. McCaffrey is manager.

ARCHULETA COUNTY.

A. Bender of the Valley Seco Oil Land & Exploration Co., drilling 6 miles from Edith, says he struck a heavy flow of gas in a fine sandstone formation last week. This gives the company an abundance of fuel with which to operate its territory. The gas flow was opened at a depth of 2060 feet.

BOULDER COUNTY.

The Elkhorn Tunnel Co., near Wall Street, resumed work on the crosscut this week.

The Skandie mine, near Wall Street, has been unwatered and development resumed. Foreman Litzenberg says they will begin shipment of ore by May 1.

In the 10-foot shaft of the Argo claim, near Boulder, a vein carrying sylvanite is reported, averaging \$30 per ton. This claim is on the west side of the Buckhorn mine.

The Colorado Northern Co. has bought the Smoky Hill mine at Sugar Loaf. It will be worked extensively by the company, as they have a tunnel running towards it, which is in 2300 feet, and will cut it at 1400 feet in depth.

CLEAR CREEK COUNTY.

The St. Paul Co. are preparing for extensive operations on their group, which is a north extension of the Aliunde, near Silver Plume. A contract has been let for driving 200 feet of tunnel, and a number of leases have been let.

The East Argentine M. Co., owners of the Sidney tunnel being driven into Pendleton mountain in East Argentine district, near Silver Plume, propose to put in an air compressor and power plant this season. The machinery will be operated by water power under a 300-foot head.

Near the Jo Reynolds mine, near Lawson, Stannish & Co. have a lease and option on the Last Chance mine. Machinery will be put in and sinking resumed.

A. H. Colburn of Idaho Springs, owner of the Sporting Times group of six claims

on Independence mountain, near Georgetown, says work will be resumed next week. Work will be done mainly through the Moore tunnel, which is in 967 feet on the main vein, crossing the claims diagonally. Stopes will be opened every 100 feet.

At the Little Jack mine, near Georgetown, worked by the St. Paul Co., in 35 feet, the grade of the ore has changed from two ounces in silver to 200 ounces in silver, 15% lead and \$2.37 in gold per ton. C. Carpenter & Co. have taken a lease on the upper workings and are breaking ore which mills 200 ounces in silver per ton. They have a 6-inch streak. A terminal site has been located and a contract let to drive the tunnel ahead to cut this group of claims 1000 feet deeper than the present workings, says Manager Teagarden.

The Gem Co. resumed operations this week in the Newhouse tunnel, near Idaho Springs.

It is reported the Vulcan M. Co. will resume on their group, near Silver Plume, this month.

CHAFFEE COUNTY.

The Ohio & Colorado S. & R. Co. has opened a lime quarry at Maysville, near Salida. The preliminary work is complete, the ground ready to patent, and the quarry will be furnishing lime to the smelters here by the 15th. E. C. Kavanaugh is superintendent. It is estimated that at the present rate of consumption the saving to the company will amount to \$25 per day, aside from the fact of the ownership of their own quarry making the company independent in the matter of lime fluxes.

CUSTER COUNTY.

The Little Bernice G. M. Co. of Florence will build a matte smelter at its mine near Custer. The sinking of the shaft another 100 feet was begun last week.

DOLORES COUNTY.

Adams & Spurlock shipped three cars of high-grade ore from their lease on Nigger Baby hill, near Rico, last week. The ore is being taken from the mine to the railway on pack animals.

FREMONT COUNTY.

At Canon City, March 26, the main portion of the smelting works of the United States R. & R. Co. was destroyed by fire, the loss being \$200,000. The fire broke out in the refinery from an unknown cause; the plant is not a total loss as its entire value was \$800,000; 150 men are made idle. Manager C. M. MacNeill says the plant will be rebuilt, using brick and steel, and the capacity will be increased.

GILPIN COUNTY.

The Sydenham M., M. & L. Co. has a lease and bond on the Maine and Hamlet groups, near Central City, and have begun developments, with S. W. Brereton as superintendent.

GUNNISON COUNTY.

The Colorado S. & M. Co., A. E. Reynolds manager, is driving two tunnels, near Pitkin—one into Terrible mountain and one under the Mineral Farm basin. Both are in over 450 feet and are nearing the ore-bearing contacts. The Hall's gulch tunnel goes into the ground in which are the Maid of Athens and Citizen mines, both of which are producing regularly. The lower tunnel level on the Maid has struck the ore shoot opened in the upper workings.

The Ben Ezra, owned by R. R. Williams & Co. of Pitkin, is in a body of silver-lead ore. They have made shipments from the upper workings, but are driving a tunnel lower down to cut the ore deeper.

The Red Cloud mine, near Tin Cup, has 250 tons of ore sacked and ready for shipment, which averages \$58 per ton.

A. Lejune of the Blistered Horn Tunnel Co., operating on West Gold hill, near Tin Cup, says that, owing to the condition of the roads, no machinery will be placed in the tunnel until spring, but, in the mean time, hand drills will be used.

The Big Four group, near the head of Cement creek, near Crested Butte, will be operated extensively this season by the Tilden M. Co. of Chicago. A body of silver-lead ore has been opened up. The ore will be brought out by pack train to the Overstep siding.

After a shut down of a few weeks the Headlight M. Co. has resumed operations on its shaft. It is down 130 feet and will be sunk deeper before drifting is begun. Manager Ehlerding says a flow of water was struck which necessitated a pumping plant, which has been put in.

J. E. Berryhill, superintendent of the Davenport and Adair tunnels, near Vulcan, reports the Davenport tunnel in 1050 feet and has cut several large low-grade veins of gold ore. The Adair is in 430 feet, with the main vein still ahead 200 feet. When sufficient ore is opened a concentrating plant will be erected.

JEFFERSON COUNTY.

W. W. Bess, manager for the South Boulder Oil & Gas Co., reports that drilling has begun on its first well on the Wagoner ranch, in the Boulder oil basin, between Ralston and Coal creeks, 6 miles north of Golden. He says the company has 500 acres in the oil basin between the oil and coal horizons, the oil sand coming to the surface in the Dakota formation, 3 miles from the land on which this well is located and east from the coal. It is expected the oil sand will be reached at 1500 feet.

LAKE COUNTY.

The Louisville mine, near Leadville, has 1000 tons of ore on the dump which it started to ship last week, says Manager Hannifen. He does not expect to open up any large bodies of ore until the sulphide contact on the Cambrian quartzite is reached. The Ulster-Newton, also under Hannifen, has men at work. The shaft will be sunk another 100 feet.

The American S. & R. Co. has sold to A. Goodstein of Denver the Union smelter and the Bi-Metallic smelter at Leadville. They will be dismantled.

The Cloud City M. Co., near Leadville, have resumed. W. S. Jones is superintendent. Shipments of manganese iron ore were begun this week. The ore body is opened up at a depth of 460 feet. It is expected to begin other development work next week.

The Arkansas Valley smelter at Leadville has started in operation its automatic sulphide sampler, which has a capacity of 250 tons per day, and is built especially to handle low-grade sulphide ores. It is operated by continuous elevator belt passing along four cars at a time; ore is shoveled in the belt and is carried to the crusher; then it is sent through sizers, the coarse being returned to the roll. From the crushers and rolls the fine is taken through an automatic separator, where one-fifth of it is automatically taken out. This one-fifth is passed through another separator and one-fifth again cut out. The smelter is running full capacity, having eight furnaces in operation and handling 900 tons of ore per day, says Manager McDonald.

The Nisi Prius mine on Iron hill, near Leadville, has resumed, being worked by J. D. Murphy and M. Starne, and a good grade of iron is being shipped, which is coming from above the water level.

The increased output of the mines around Leadville during the last ten days of March brought the production of the district up to 2800 tons a day. Smelters are in the market for all the good iron ore they can get. To the production will be added another 100 tons by the opening of the manganese market by the Pueblo Steel Works, which contracted to start with 125 tons a day. This will come principally from the Sixth Street and Catalpa-Crescent mines.

MINERAL COUNTY.

W. H. Bryant of Denver, manager of the Humphreys mill, near Creede, says they have resumed, having been closed down since the early part of the winter, due to shortage of water. They are handling 350 tons of ore daily. It will treat all of the ore of the Big Kanawha M. Co.

OURAY COUNTY.

The Fowler smelter, 1 mile north of Ouray, opposite the Grand View mill, has been sold to the Ouray Chief M. Co. and Manager D. Woods says it will be ready to blow in by May 1. The smelter has a capacity of 100 tons per day.

SAN JUAN COUNTY.

The Astor M. Co. has organized at Silverton and has taken over the claims of the Sioux M. Co. and the Wigwam G. M. & M. Co., near the mouth of Picayune gulch. The new company will build a mill and will enlarge the power plant.

The Galty Boy group, in Dry gulch, near Gladstone, will be reopened and improvements made, work on which will be started this month. A tunnel has been driven on the group, opening up the vein with 300 feet depth which has been drifted on for 75 feet, the ore being 3 feet wide. This drift will be continued till it comes under the ore shoot, 350 feet ahead.

The Magnet mine, owned by D. J. Wells, near the Burro bridge near Silverton, will resume.

SAN MIGUEL COUNTY.

The Gazette says there are a few mills near Telluride which close down every winter because of the water supply freezing, resuming when the snow melts in the spring. Among those idle the past winter, and which will start up this month, are the Smuggler-Union and Tom Boy. One of the Smuggler-Union mills has been running steadily crushing 250 tons of mineral daily. The idle mill has a capacity of 200 tons and when it resumes it will be necessary to put 200 more men in the

Smuggler-Union mines. The new mill of the Tom Boy Co., handling ore from the Argentine and Cincinnati, has been steadily in operation since November 1, but the Tom Boy mill proper, capacity 225 tons daily, has been hung up since December 1.

J. McDonald and C. Trone of Telluride have a lease on the Santa Cruz mine, near Ophir, and have started development work.

SUMMIT COUNTY.

The Gold King mine in Clinton gulch, near Kokomo, is being worked and a mill will be built this spring.

The Miller group, 1 mile from the Little tunnel (the Klondyke), on Fletcher mountain, near Kokomo, will resume, says H. Miller, the owner. A mill will be built this spring.

V. E. Myer intends starting up the Aetna and Vesuvius gold mines on Fletcher mountain, and C. Anderson will open up the Peerless and Matchless.

TELLER COUNTY.

Operations are started on the Ajax claim of the Beacon Hill Ajax Co., on Beacon hill, Cripple Creek, by A. P. Gallagher & Co., who have a three years' lease. They will sink a two-compartment shaft to 500 feet before they do any extensive lateral work.

The directors of the Maggie G. M. Co. last week granted a lease on the north 500 feet of the Maggie claim on Bull hill, Cripple Creek, to Blair, Harris, Dickson & Crompton, for 2 years at 20% royalty, and the lessees are to sink the shaft an additional 150 feet. The shaft is down 300 feet, with crosscutting and drifting. The property adjoins the Gold Sovereign.

Work on the reduction plant being built by the Globe M. & R. Co. in Goldfield is progressing and it is expected the mill will be ready for operation by the 10th inst. It will have a capacity of 100 tons of ore per day. The company is putting in a steam plant of machinery at the mine.

The directors of the Golden Cycle Co. at Cripple Creek have closed the mine, due to the inability of the company to market the ore which is being mined. One of the directors stated that there are 15,000 tons of ore already broken down in the mine, running \$20 per ton. In addition to this amount, there are 500 tons of ore in transit.

The Cripple Creek M. Co., near Cripple Creek, has suspended work on the Giorietta shaft, and is working that block through the main shaft of the Hull City placer mine. Ore of a smelting grade, value \$40 per ton, is being shipped regularly.

Superintendent Taor of the Cripple Creek Gold Temple M. Co., leasing on the Gold Sovereign group at Cripple Creek, says the Fox vein has been opened up 150 feet south of the shaft, at a depth of 600 feet from the surface. The vein is 6 feet wide and carries free gold giving an average assay of \$32.

The Ophella tunnel, near Cripple Creek, will use electricity for lighting their entire workings; also a machine to operate a blower for ventilating purposes will be put in.

No leases have yet been granted by the executors of Stratton's Cripple Creek M. & Dev. Co. Owing to the suit now on trial at Colorado Springs and to the mill strike, the executors decided to postpone the granting of leases for the present.

J. L. Morris & Co. have a lease on the dump of the Ingham mine, at Cripple Creek, and they propose to build a cyanide plant this month.

It is reported the Electro-Chemical Ore Reduction Co., backed by Chicago men, will build a 300-ton mill at Victor next summer. C. Smedeker says a site for their mill has been bought near the Florence & Cripple Creek depot.

IDAHO.

BOISE COUNTY.

The concentrating mill at the Lincoln mine, near Pearl, J. T. Hodson, manager, is in operation. The plant has a capacity of 100 tons of ore a day and is operated by a 40 H. P. gasoline engine. The mine is developed to a depth of 300 feet, with 365 feet of drifts run on the ledge, which is 5 feet in width.

CUSTER COUNTY.

P. L. Fearn, consulting engineer of the White Knob copper mine at Mackay, says the company will blow in their smelter installed last season. It has a capacity of 900 tons a day. There are sixty men at work in the mine blocking out ore, which carries 3% copper and \$2 gold and silver. The shaft is down 700 feet, which connects with a tunnel 3000 feet long. The company has an electric railway 10 miles long connecting the mines with the smelter. It has a grade of 6% and carries a train of ten cars of five tons each.

The Haggan-Salisbury mine (the Ram's Horn), near Custer, has suspended operations.

GRAND COUNTY.

McCormick & Co. will start work April 10 on the Gold Coin group, east of the Tornado, on Gold Hill mountain, near Basin.

IDAHO COUNTY.

The two cleanups of the American Eagle mine at Elk City, owned by Spokane men, for the first half of March amounted to \$5700. In January the 10-stamp mill began operations and since that time \$23,000 has been produced. Superintendent R. M. Sherman says 14 feet of ore has been opened in the lower tunnel at the depth of 200 feet, showing values in gold.

The Bullion group of claims on the east slope of Thunder mountain, near Roosevelt, joining the Gold Eagle on the east, are reported sold to the company represented by D. McKenzie, for \$15,000. Development work will begin this month.

It is reported the Big Buffalo mine, near Hump in the Buffalo Hump district, will close down this month till the summer season, and they will equip the property with a 60-stamp mill, electric plant and a cyaniding plant.

JEFFERSON COUNTY.

The Montana Ore Purchasing Co., operating the Katie concentrator, near Basin, have had surveys made for a dam in which to discharge the slums from the mill, which heretofore have been dumped into Boulder creek. A flume is being built from the mill to the flat east of the concentrator.

OWYHEE COUNTY.

Electric drills have been put in operation at the Alta Vista mine, near Silver City.

INDIANA.

WARRICK COUNTY.

Porphyritic ore assaying \$40 gold is reported in the Snake Knobs mountains, near Lynnvill, on the Harrington farm, owned by C. Zimmerman. A shaft, a crosscut and a drift have been driven, opening up a 4-foot vein for 20 feet.

LOUISIANA.

CALCASIEU COUNTY.

In the oil field 3½ miles from Welsh fourteen derricks are up, of which nine are completed wells. Some of these came in as gushers, but are now pumping. Two wells on the Welsh Oil, L. & D. Co. were abandoned on account of the pressure of gas, which at the beginning of operations here was not understood, says the Record. The producing wells so far are Nos. 3 and 4 of the Welsh Oil, L. & D. Co., Nos. 1 and 2 of the Southern Pacific Co., and one each of the Southwestern Co. of Mobile, Ala., the Colorado & Texas Co., of Denver, Colo., the Metropolitan O. Co. of Mobile, Ala., the Hill Top Co. of New Orleans, La., and Lively & Brown of Beaumont, Tex. The present producing wells in this field average from 1000 to 1200 feet in depth.

MICHIGAN.

HOUGHTON COUNTY.

The directors of the Tamarack M. Co., operating near Calumet, submit the following report for the year ended Dec. 31, 1902:

Gross value of fine copper produced (15,961,528 pounds, at 11.87c).....\$1,894,320
Running expenses.....1,744,598
Construction expenses.....154,877

The rock coming from No. 5 shaft has not shown the copper contents expected. The amount of development work so far done, while quite extensive, is yet small in comparison to area of ground tributary to the shaft; but development will be increased as rapidly as possible. Meanwhile the reserves opened up in the past will still furnish ample rock of grade to maintain production.

Comparative results for 1902 and 1901:

	1902.	1901.
Tons rock mined....	837,568	773,783
Tons rock hoisted...	763,209	688,622
Tons rock stamped...	658,720	626,905
Pounds mineral obtained.....	25,747,931	29,998,094
Cost per pound at mine, exclusive of construction.....	9.51c	8.48c
Cost per pound construction.....	0.97c	1.56c
Cost per pound of smelting, etc.....	1.42c	1.63c

Total cost per pound refined copper....11.90c
Cost of stamping per ton of rock.....23.299c 24.953c

The principal construction expense for the year has been incurred for the purpose of completing the equipment work in No. 5 shaft. The mill has run steadily during the year.

The 45-drill compressor at the North

Kearsarge, at Calumet, went into regular service last week, furnishing air for the entire mine. The work of dismantling the two old compressors has begun and the 30-drill machine will be moved to the new compressor house. Six additional drills have been started at the South Kearsarge, making twelve drills in that part of the Osceola put on recently.

Baltic mineral, near Houghton, exclusive of stamp copper, is showing thirty-one pounds to the ton. Isle Royale for the past year shows 60 pounds of pure silver, 700 pounds half breeds (half copper and silver) and balance of silver up to \$8881 gathered from mineral cast into anodes and separated by electrolytic process at Perth Amboy, N. Y., from anodes shipped from Quincy smelting works.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The rumored advance of lead concentrates to \$65 per ton has not materialized, the price remaining the same as the preceding week—\$58 50 per ton, delivered. The top price of zinc concentrates was, however, advanced one-half dollar per ton, two lots bringing \$41 per ton. The assay basis price for the best grades of ore was as high as \$37 per ton for ore assaying 60% metal, but considerable ore sold on a basis of \$36, and some even less, during the forepart of the week. Although the sales for the first twelve weeks of this year were 6599 tons of zinc and 1179 tons of lead less than the first twelve weeks of last year, the value is greater by \$12,929—the effect of higher price for both zinc and lead this year. A year ago zinc sold at \$34 per ton, and lead is \$15 per ton higher than this time last year. The following is the sale of ore from the Joplin district for the week ending March 21:

	Pounds.	Value.
Zinc.....	20,256,540	\$176,390
Lead.....	903,310	27,424

Total.....\$203,814

The following is the sale of ore for twelve weeks:

Zinc.....	105,963,970	\$1,678,947
Lead.....	12,069,680	319,268

Total.....\$1,998,215

Joplin, March 28.

MONTANA.

BEAVERHEAD COUNTY.

From the Ajax mine, near Dillon, owned by A. J. Noyes and J. E. Morse, was shipped last week two bars of gold bullion, value \$2500, the result of twenty-two days run of the mill. The mill is 4500 feet from the mine and the ore is hauled over a wagon road. It is intended to put in five more stamps and other machinery this spring. Assayer T. B. Landers tells the Dillon Tribune that during this winter the ore worked has averaged \$125 a day on the plates and the concentrates will go 25% lead, 7 ounces in silver and \$25 in gold. The ore averages \$10 a ton. W. B. Stanchfield is superintendent and has twenty-five men at work.

CHOTEAU COUNTY.

A. G. Staten reports finding anthracite coal 10 miles south of Havre. The vein stands vertical, is 4 feet thick and strikes into one of the peaks in the chain of Bear Paw mountains.

DEER LODGE COUNTY.

At Anaconda the Amalgamated C. Co. has several hundred men at work on the smelter excavation and foundation for the flue which is being put in place at the Washoe smelter. The stack will be on one of the highest peaks near the works, and it is proposed that the smoke, fumes and other poisonous substances from the furnaces will be conveyed to it by means of a flue built along the mountain. By this it is expected the fumes will be carried to such a height that they will not settle and destroy the vegetation.

FERGUS COUNTY.

J. W. B. Parry of Denver, Colo., has bought the Gudgell group of five claims in the North Moccasins, near Lewistown, and will begin development work next week.

LEWIS AND CLARKE COUNTY.

The mill of the Big Indian M. Co., 4 miles south of Helena, has sixty stamps dropping. It is the intention of the owners to enlarge the mill.

The New World M. & D. Co. has been incorporated at Helena by B. B. Kelly, D. Boyd et al.

The Butte & St. Paul M. Co., incorporated under the laws of Arizona, filed its articles at Butte last week; F. H. Pilling, J. P. Hansen, C. J. Smith.

The Sullivan M. Co. have secured \$100,000 for the completion of their smelter at

Marysville, says Manager Finley, and it is intended to begin operations at the mine this month.

P. Solaro, from the Mary Aloys mine, near Rimini, is taking out ore from an 8 inch streak, and a former shipment gives returns of 110 ounces silver and 34% lead.

Operations were resumed at the cyanide plant of the Montana M. Co., at Marysville, this week.

MADISON COUNTY.

W. Parker, manager of the Maggie Gibson dredger, operating near Virginia City, has men at work overhauling the machinery preparatory to the summer's work. They have a lease on the placer ground of the Conrey Co.

H. Lloyd, who, with J. D. Land and R. T. Smith, is developing the Gold Bug mine, 4 miles from Pony, says shipments will begin next month. The snow is deeper in the mountains this spring than it has been for many years past, assuring plenty of water for mining and milling purposes this season. In the Ben Harrison mine, owned by Lloyd, he says free-milling gold ore has been opened, and a 5-stamp mill will be built this summer.

The Pony Sentinel says work was resumed on the Clipper-Boss Tweed group of mines near Pony last week. In addition to the work on the Boss Tweed mine, the Clipper will be further developed, both of which mines can be ultimately operated from the workings now under way. A tramway from the mine to the mill, in a direct line 2.1 miles, will be built next month and the 100-stamp mill completed. A. C. Carson is superintendent.

MISSOULA COUNTY.

The coal deposits near Missoula are to be developed this season by the Missoula Coal Co., organized last week by Missoula and Lincoln, Neb., men. It is proposed to begin operations on the coal that has been opened on the Richili ranch, 2 miles northwest of Missoula.

Since the recent strike of 8 feet of concentrating galena on the Tarbox, 3 miles from Selteese, the company has decided to erect a 100-ton concentrator the coming summer. The company own a millsite below the mouth of the working tunnel and a water right. Average assays made last week gave 27% lead. The ore was taken out 250 feet below the surface. R. Dixon of Wallace, Idaho, is president and manager.

SILVER BOW COUNTY.

Manager Buckley of the Travona mine of Butte has in twenty-eight shifts driven a drift 310 feet, the men working eight-hour shifts, says the Inter-Mountain.

The Butte M. & D. Co. will develop the Emma mine to 1200 feet. At 800 feet the lead shows 2% copper, 20% lead, twenty ounces silver and two ounces gold. In the upper portions of the mineral zones of Butte lead, silver and gold values predominate, but with depth copper appears.

NEVADA.

ELKO COUNTY.

Machinery for the mill at the Latham mine, near Wells, is on the ground.

HUMBOLDT COUNTY.

The Arizona mine, operated at Unionville, by the California-Nevada M. Co., has been shut down.

LINCOLN COUNTY.

The Nevada Keystone M. Co. in Yellow Pine district has started up its mill at Sandy and is handling twenty tons a day. The mill had been closed down since Dec. 15 last, during which time improvements were made in the mill and around the mine, including the addition of a hoisting plant.

At the Cyrus Noble mine, near Searchlight, an upraise is being driven from the 100-foot level north drift to the surface. Sinking in the main shaft is down 170 feet.

NYE COUNTY.

E. Hirschler of San Francisco, Cal., has bought the Osborn group of eight claims at Lone mountain, the Johnson group of eight claims at Gold mountain and the Estell group of six claims, 1½ mile south of Butler, for \$13,000.

J. C. Griffin reports gold quartz found on the south end of the Cutting & Griffin group, near Butler. The ledge is 4 feet wide on the surface. The eleven southern claims of this group have been incorporated as the Minetta M. Co.

A strike is reported made in the Fraction mine at Butler, on the south drift of the 400-foot level, showing a 9-foot ledge which averages \$100 a ton. The winze on the 300-foot level has cut a ledge 4 feet in thickness that averages \$80.

D. G. Doubleday of San Francisco, Cal., has bought the Moonshine and Blue Forge claims, on the same ledge as the Newhouse mine, at Hannapah, near Butler, and the Hannapah Mutual M. Co. of

San Francisco has been formed to work the group.

F. W. Johnson has bought the Pequot group of six claims on the southwest slope of Lone mountain, 11 miles from Butler. A ledge 2 feet in width and carrying values of \$60, with a percentage of copper, has been opened up.

STOREY COUNTY.

The Enterprise says one shift has been laid off at the Butters cyanide plant in Six-mile canyon, near Virginia City, and the system of working changed. The company made a cleanup of \$40,000 last week, the tailings, after leaving the tanks, assaying 25 cents a ton. Changes will be made in the method of delivering the tailings to the tanks whereby three men and four horses will do the work of forty-five men.

The three Reldler pumps placed on the 2150-foot level in the Con. Cal. & Va. shaft at Virginia City were put in operation on the 28th ult. and measurements showed that in an hour's run the water was lowered 10 feet. They are run by electricity. The 16-inch shaft of the main hoisting engine at the C. & C. shaft was found to be fractured, and until replaced all underground work except that required about the pumps will be suspended, putting 100 men temporarily out of work.

WASHOE COUNTY.

H. Olinghouse shipped a gold bar of \$3300 value last week, the result of milling 125 tons of ore from the Gold Center mine in Olinghouse canyon, near Wadsworth, says the Journal. He has taken up the bond for \$8000 which he has held on the Gold Center.

WHITE PINE COUNTY.

J. R. Leask, superintending the erection of smelting works at Keystone, near Ely, for the New York & Nevada C. Co., received a telegram from the East last week ordering all work stopped and the discharge of all employees, pending the arrival there of J. P. Evans, when the location may be moved.

At Cherry Creek P. H. Cannon & Co. will put up a 20-stamp mill. They have bought the Exchequer mine. The mine was never operated below the water level, but it is known that rich ore exists at that point, says the Reno Journal. This mine is near the Star mine, owned by the Glasgow & Western Exploration Co.

NEW MEXICO.

COLFAX COUNTY.

At Baldy, A. W. Ward has men at work on the Aztec mine, which is equipped with a 40-stamp mill.

On Aztec hill J. James is opening up and blocking out ore on the Rosita. In places the lead is 12 feet wide.

A. Monroe has a lease on the Black Horse group. He is taking out ore and crushing it in the 10-stamp mill.

Work has been resumed on the Thelma. The milling plant, including a cyanide outfit that will treat twenty tons of ore daily, is in operation. The parties in charge of the Thelma are also developing the Montezuma. It is proposed to consolidate the Thelma and the Montezuma interests.

GRANT COUNTY.

The Jack Doyle lead carbonate claim, 5 miles south of Stein's Pass, has been sold to W. Morris. A shaft is down 50 feet, at which point the vein is 2 feet wide, running 30% lead.

At Stein's Pass, the Beck mine of the National G. & S. M. Co. has put men at work. A boiler, pump and hoisting machinery are being put in.

Men are at work on the McKinley mine, at Burros, sinking the shaft. The first shipment will be made April 15. The McKinley is an extension of the St. Louis vein and is owned by R. P. Thompson and O. J. Westlake.

C. R. Smith, superintendent and manager Wilson M. & M. Co., at Stein's Pass, says the 10-stamp mill is being overhauled and a hoist is being put in on the Volcano mine. The ore carries gold and silver, averaging \$9 gold a ton, and is free-milling. Pan amalgamation is used.

LUNA COUNTY.

The Tres Hermanos G. M. Co., of Boston, has bought the Yellow Jacket mine at Tres Hermanos and machinery will be placed. The company has located two other claims, a total of forty acres, adjoining the Yellow Jacket.

OTERO COUNTY.

W. H. Price and A. C. Kerr of the Jarilla C. Co., near Jarilla, says development work will be resumed and shipments begun next month.

SOCORRO COUNTY.

The New Mexican says the F. A. Jones iron mines, at the north end of Oscura mountains, southeast of Socorro, have

been sold to the Colorado Fuel & Iron Co. The ore is hematite, running 40% iron. They are 17 miles west of the El Paso & Rock Island Railway and 30 miles south-east of Progresso, Torrance county. Foundries and rolling mills will be erected. Coal can be obtained from Clark, in this county, or Dawson, in Colfax county.

A 50 stamp mill and a cyanide plant are in process of erection by the Socorro G. M. Co. in Cat Mountain district, near Socorro. Four shafts and much tunnel work has been done on the group. It is claimed the ore will average \$18 per ton. It will be carried to the mill by tramway.

OREGON.

BAKER COUNTY.

The North American G. M. Co. of Seattle, Wash., have sunk a shaft on their Porcupine mine, near Sumpter, to a depth of 100 feet. The ore shoot is showing 18 inches wide, assaying \$16. It is proposed to put in a compressor and power drills and drive a crosscut tunnel 1200 feet to cut the ledge at a depth of 800 feet. The plant will be built below the present workings, on Wind creek.

On the Gold Bug-Grizzly group of ten claims in Ibex district, near Sumpter, controlled by Eastern men, development work will begin next week, says Manager J. J. Hennessey. The group adjoins the Ibex on the west.

The Golden Wizard Co. are preparing to erect a mill on their group, near Sumpter, this summer, says Superintendent J. M. McPhee. It is proposed to put in a plant of 100 tons daily capacity.

F. P. Schultz of Milwaukee, Wis., president of the Old Abe mine, in Minersville district, near Baker City, says two 80 H. P. boilers, a 6-drill compressor, a double-cylinder 9x14 hoist and a sinking pump with a capacity of 350 gallons a minute are to be put in. In addition to this the company propose to install a mill and cyanide plant in the fall capable of handling 200 tons of ore a day. They have 600 feet of development work done. Cross-cutting has advanced 105 feet and is still in ledge matter. Average samples assay \$3.81. The ore contains neither chalcocite nor galena.

All the machinery for the Sumpter smelter at Sumpter is on the ground and is expected to blow in by May 1. The lime quarry has been opened up. A reservoir is being built on the hill above the smelter. The Sumpter Valley railroad will build yards and switches running to the smelter.

The Gold Pan M. Co., near Sumpter, say a hoist will be erected this spring, capable of sinking 500 feet. The group has been developed by a series of tunnels and shows high-grade ore. The Geiser-Hendryx Co., which has the management of the Gold Pan group, will also install a sinking plant at the Midway Con. group.

DOUGLAS COUNTY.

The Flamm mine, on Hogem creek, a tributary of Starveout, near Glendale, is reported sold to A. Scott of Chicago, Ill., for \$12,000.

PENNSYLVANIA.

SOMERSET COUNTY.

The Berwind White Co. of Windber, employing 4000 miners, has posted a notice of an advance of wages to machine miners of 12%.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence)—The Crown mica mine, 3 miles northwest of Custer, is preparing for a good season's shipment. This mine has shipped over \$300,000 worth of mica, the last shipment being about ten carloads in 1901-02. It is intended to make large shipments during the present year. D. H. Hault is superintendent.

Custer, March 30.

LAWRENCE COUNTY.

The shaft house of the Hidden Fortune Co. on the Bingham mine, Poorman gulch, near Lead City, which was burned on the 25th ult., will be rebuilt. This shaft is sunk on the large ledge of the Bingham which is found in the schists. Overlying the schists is a sedimentary formation which also carries ore, and which will supply the new mill recently completed below Deadwood, says Secretary G. D. Begole.

The Minerva mill in Blacktail gulch, near Central City, has been reconstructed and will be operated as a cyanide mill. The mine has considerable development, and will produce 150 tons daily.

A strike of good ore is reported in the Cleopatra mine in Squaw Creek canyon, near Cold creek, in the lower quartzite of the Cambrian. There are values in this vicinity in both the upper and lower quartzite and overlying limestone.

The Hidden Fortune M. Co. will rebuild their hoisting works, near Deadwood, which were burned down last week. The

plans call for a shaft house and hoisting machinery (capacity 1000 feet), electric light and power plant and carpenter shop. W. R. Dickinson and N. R. Treweek are local directors.

Articles of incorporation were filed last week by the Homestake Belt G. M. Co. of Deadwood, and also the Burlington M. Co. at Deadwood.

The Gladiator M. Co., near Deadwood, is putting in an air plant, consisting of a 100 H. P. boiler and an air compressor, as well as a pump and a double-cylinder, friction-gear drum hoist.

PENNINGTON COUNTY.

(Special Correspondence)—The Cochran mine, near Rochford, is reported being negotiated, the Black Hills Copper Co. being the prospective purchasers. The mine was discovered in 1878, and was known as the Jenny Lind. It was sold to a corporation known as the Alta-Lodi Co. They built a 40-stamp mill, and after a brief existence the mine was closed and the mill removed to the Look-out mine, on Castle creek. J. Cochrane relocated the mine after several years, did a little development and opened a good-sized vein of \$15 gold rock, which he worked in a Huntington mill. He sold the property, after taking out a large amount of money, for \$25,000. The new owners did not make a success of it, and Cochrane again came into possession of the mine, which he has reopened and is now selling again.

Rochford, March 26.

The Holy Terror mine at Keystone is now down 1200 feet and is the deepest mine in the Black Hills. The vein is composed of crystallized quartz containing free gold with pyrite and arsenical iron sulphide. The vein produced a large amount of gold in its upper working and then became poor, though the vein continued uninterrupted. Exploration was continued in depth and a new pay shoot discovered, which has continued to the lowest levels thus far opened. R. B. Hughes is superintendent.

E. L. Hurlbut, secretary of the Rapid City Light & Fuel Co., says they will begin boring for oil near Rapid City the coming season.

The Sunbeam, near Redfern, is down 240 feet with its shaft, at which depth a station is being cut. Machinery for a 10-stamp mill is on the ground. The ledge has widened from 1 foot at the top to 8 feet at 240 feet, and shows an average assay value of \$100 per ton, says the Black Hills Review.

The Servian-American G. M. & M. Co., operating in Oro district, owns 500 acres of ground 2½ miles east of Redfern, adjoining the Sunbeam. The ore bodies run 5 feet wide, with values of \$10 per ton in gold, free-milling, and concentrates have been obtained giving an assay value of \$55 per ton. On one of the ledges a 50-foot shaft has been sunk on a 3-foot quartz ledge which shows an average value of \$15 per ton. Manager Stankovitch says a 10-stamp mill will be built.

UTAH.

BEAVER COUNTY.

A group of ten claims adjoining the Montreal and Old Hickory in Rocky district, near Milford, has been sold to a Salt Lake syndicate, J. C. Stewart manager, for \$25,000. A 70-foot shaft has been sunk.

GRAND COUNTY.

Manager Clark, owner of the Clark group of claims at Gold Basin, La Sal mountains, will put up a 100-ton cyaniding mill this month. There are 1500 feet of development work done on the group.

JUAB COUNTY.

The Mona mill at Mona resumed this week.

F. L. Wilson of the Lucy L. mine of Deep Creek district, near Fish Springs, says work has resumed.

PIUTE COUNTY.

S. F. Mount has a bond and lease on the L. & N. group, south of Gold Mountain district, near Marysvale. About 500 feet of work has been done on the group, including open cuts, shaft and tunnel. The shaft is on the south border of the 300-foot lode, which averages \$4 gold a ton.

SALT LAKE COUNTY.

The Bingham Bulletin says the Boston Con. C. Co. instead of depending on an extension of the Copper Belt railroad will build an aerial tramway to the Rio Grande Western depot, paralleling the Highland Boy tramway. The survey has been made.

Manager Wall has started development work at the Kempton mine at Bingham.

Manager T. Jacobson of the Columbus Con. mine of Alta, says it is proposed to erect a concentrating plant at the mine and to put in an electric power plant in Little Cottonwood canyon, to generate

power and light for use of all the mines of the camp which may choose to contract for such.

The Dewey mill at Bingham will resume.

SUMMIT COUNTY.

Articles of incorporation of the Avondale M. Co. were filed last week; L. Moore of Cincinnati, Ohio; D. S. Taggart, E. W. Wilson and C. E. Hudson, Salt Lake City. Their claims adjoin the Naildriver at Park City.

Superintendent C. L. Rood of the Naildriver, at Park City, says the galloways-frame is in position and the engine is being set up. It is expected to resume sinking by the 25th inst.

TOOELE COUNTY.

It is reported that the Mono mill in Dry canyon, near Ophir, will resume.

UTAH COUNTY.

The Colton Wax M. & Oil Co., principal office at Milwaukee, Wis., has been incorporated by T. J. Pringle, B. Hauser, P. Auschuetz and J. C. Grieb, to transact a general mining business, including boring for oil and refining petroleum and oil. The company owns wax claims near Colton.

WASHINGTON.

OKANOGAN COUNTY.

The Prospector says the Copper World mine, near Loomis, is under option to Eastern men, with W. B. Moore manager.

SNOHOMISH COUNTY.

The Imperial M. Co. of Marysville resumed work on the Imperial group, near Silverton, last week. M. Swinnerton is superintendent.

WYOMING.

BIGHORN COUNTY.

The Cody Oil & D. Co. will begin drilling its first oil well near Cody May 1st.

CARBON COUNTY.

It is expected that the reduction plant of the North American Copper Co. at Grand Encampment will be in operation May 1st. At the concentrator the machinery is all in place. The roaster building above the smelter is completed. At the smelter the additions consist of a 300-ton blast furnace, two converters, mud mill, twenty-ton crane. At the sampler a 50 H. P. motor has been put in to be used instead of the steam engine. A 4-foot 4-mile pipe line, to convey water from the Encampment river to the power house, is being built.—At the Ferris-Haggerty mine of the company development work continues and Superintendent Bunce says they will supply the smelter with 200 tons of ore per day. An aerial tramway has been put up.

CROOK COUNTY.

North and east of Moorcroft, in the southern part of this county, there are six companies, besides other parties operating in the oil fields. The Butte Crude Petroleum Co., of Montana men, H. Albertson of Butte, manager, have a well down, and are in red sandstone. Last season the Nebraska O. & A. Co., H. Rathbun of McCook, Neb., president, put a well down 1500 feet, on which work will resume this spring, and another well will be started. Drilling will be begun May 1st by the Senate A. & O. Co., W. B. Hunt of Winchester, Ind., president. They control 1600 acres, both as an oil and an asphalt proposition.

FOREIGN.

AFRICA.

RHODESIA.

The Rhodesia Chamber of Mines reports production for January, 1903:

	Ozs.	Dwts.	Value.
From mill.....	13,400	1.87	£48,508
From tailings.....	2,606	17.52	7,916
From other sources.	237	11.90	861
Totals	16,244	11.29	£57,285

AUSTRALIA.

QUEENSLAND.

The recently discovered lode in the 750-foot level in the Mount Morgan mine has been followed 140 feet. For 110 feet the average of the assays shows one ounce per ton; but the last 30 feet shows poorer values. It is believed the ore in that part will not average more than five pennyweight. The opening of this lode is being watched by owners of gold leases adjoining the Mount Morgan, as it is considered possible the lode will extend for considerable length, says the London Mining Journal.

At Gladstone it is reported that men in the Dawes mountains, 60 miles from Gladstone, have discovered a large body of

ironstone which is auriferous. Samples yielded as high as five ounces of gold per ton. Large numbers of miners are flocking to the ground, and already three miles of leases have been pegged.

At Wolfram camp most of the wolfram mines are yielding fine molybdenite, which is selling for £170 per ton on the field. The mineral occurs in vugs associated with wolfram and bismuth and has to be separated by hand picking. Some of the claims have large outputs and are yielding good profits. The camp is on the upper waters of the Walsh river, and 14 miles from Dimboola.

VICTORIA.

Pay copper ore in quantity has been found near Buchan, in Gippsland. The necessary fluxes abound. Trial samples in bulk have been sent to New South Wales Metallurgical Works for treatment, says the Standard.

WESTERN AUSTRALIA.

The Mining Standard reports Kalgoorlie January crushings include: Ivanhoe battery treated 12,052 tons for 4590 ounces, cyanided 6710 tons for 2012 ounces, slimes 4722 tons for 1588 ounces, telluride 348 tons for 463 ounces, concentrates 620 tons for 1958 ounces. Total, 12,400 tons for 10,611 ounces fine gold, valued at £45,043. The Hainault crushed 860 tons for 490 ounces, valued at 77s 10½d per ton. Brown Hill Extended treated 2041 tons of sulpho-telluride ore at Hannan's Star Ditch plant for 5115 ounces. Kalguril treated 3630 tons for 3441 ounces 19 pennyweight of gold of standard fineness. Hannan's Reward and Mount Charlotte crushed 400 tons for 338 ounces, valued at 76s per ounce; Hannan's North, 412 tons for 149 ounces 10 pennyweight, valued at 76s per ounce.

Kalgoorlie mines have been connected with the temporary pipe line from the Mount Charlotte reservoir until such time as a permanent and larger pipe line is laid down. The price at which the water is being sold to the mining companies is nearly £1 per 1000 gallons less than the cost of condensed water. At the Great Boulder, where 20,000 gallons of that class of water is used daily, a reduction of about 1s 6d per ton of ore treated will now be made.

BRITISH COLUMBIA.

The Wakefield mines at Silverton, in the Slokan, will start up May 1, and its concentrator will be put in shape to run on the reserves of ore that were blocked out last season.

The Minnesota Silver Co.'s mill, near Slokan City, has started on Ivanhoe ore. There are twenty men at work at the mines.

At the Kootenay mine, near Rossland, machine drills have been added to the equipment, making five in operation on the third and fourth levels.

The Yreka C. Co. at Quatsino is making additions to its plant at Quatsino, says Manager W. C. Spicer. They will also put up a sawmill on the water front, capacity 10,000 feet a day. The company is shipping 3500 tons of ore per month.

W. J. Robinson of Philadelphia, Pa., manager of an Eastern company, has bought the Ophir group of hydraulic leases, containing 200 acres, near Atlin, for \$35,000. They will exploit this ground by means of prospecting drills preparatory to putting in a dredger.

The members of the Stevedyke Hydraulic M. Partnership, Ltd., at Atlin, have decided to consolidate their holdings and incorporate as the Stevedyke Con. G. Fields, Ltd.

During the strike of the coal miners in East Kootenay, shutting off the coke supplies of Boundary smelters, which has now lasted seven weeks, the Granby and the Snowshoe companies, in Phoenix camp, were about the only ones in Boundary that kept steadily at work. Up to a few days ago the Snowshoe was shipping, but was forced to discontinue when the Sunset smelter at Boundary Falls ran out of coke. However, the miners are still at work at the Snowshoe and ore is being blocked out in larger quantities. At the Granby mines Superintendent Williams kept a large number of men at work during March, but they are now being somewhat reduced. But two furnaces at the smelter are in blast. This cuts the ore shipments down to 750 tons daily. In the meantime ore has been broken down in both the Knob Hill and Old Ironsides mines, in preparation for resuming shipments on the 1500 tons per day basis. The smelter's ore bins are full, as well as those at the mines, making a combined tonnage of 30,000 tons. In the Knob Hill the workings are so filled with ore that work on the property, except in the upper glory hole workings, has had to be temporarily suspended. At the smelter they have been dependent entirely on the limited supply of coke that is coming in from the Vancouver Island collieries.

CANADA.

NOVA SCOTIA.

The Boston News says Halifax advices report that the fire in Dominion No. 1 colliery at Glace Bay is increasing. Men are working with brick and mortar to dam the fire within an area of 200 yards square. When this is finished that section will be flooded and if the dams hold and no explosion occurs the mine will likely be saved, but the loss to date is serious.

INDIA.

Manganese is being mined at several places in India, and is being very largely railed from Tharsa and Kampti stations on the Bengal-Nagpur Railway, in the Central Province, says the Mining Standard. In both cases the ore is carted from Ramtek, from 12 to 15 miles north of these stations. Recently good ore has been found near Balaghat, on the southern section of the Satpura Railway, and it has been decided to run a branch to the mines by the Bengal-Nagpur Railway.

KLONDIKE.

Twenty-seven Klondike claims, comprising 1½ mile of Gold Run creek, near Dawson, have been sold for \$2,000,000 to a syndicate of London and Paris men, who have incorporated the Gold Run M. Co. A. E. Willis is manager, with headquarters in London. Most of the ground included in the deal comprises consecutive claims, permitting its operation by hydraulic methods on a large scale.

NEW ZEALAND.

The Wahi mine has paid nearly \$5,000,000 in dividends and interest. The value of the hulkion to Jan. 1, 1903, was \$12,132,134.65, all of this amount, except \$467,079.25, having been obtained during the past ten years.

MEXICO.

CHIHUAHUA.

The Guggenheims started up the other two units of their concentrating mill at Santa Barbara this week, making the capacity 450 tons daily. Only one unit of 150 tons daily has been used since the plant started up a few months ago, owing to a shortage of water.

Manager J. R. Harbottle of the Guazapares M. & M. Co., operating at Guazapares, says men have been scarce to operate the mine this season. Their 50-ton lixiviation plant is in operation.

The tunnel of the Josephina mine at Cusihuiriachic is in 150 feet on a 300-foot contract. Shipping ore is being taken out carrying values in gold, silver and lead. It is the intention to extend this tunnel 1000 feet. The vein is 15 feet wide and a 1000-foot tunnel will give a depth of 700 feet.

At Santa Eulalia last week C. A. Aiken and D. Jackson of San Francisco, Cal., were given an option on seven mines aggregating 115 pertenencias, and work will begin this month. The group includes the Buena Tierra, San Antonio, La Carolina, La Fortuna and Nueva Santa Eulalia.

Roasters are being put in at the Red Hill mine, near Chihuahua. The process heretofore has been pan amalgamation only.

Electric drills are in operation at the San Francisco del Oro mines, near Santa Barbara. The Montezuma Lead Co. at Santa Barbara is working on 4200 pertenencias of mineral ground.

A. L. Rossen and A. B. Callender have had to stop work in their Maria mine at Parral and will put in pumps and drilling machinery.

E. J. De Witt has a bond and lease on the St. Augustine mine, south of the Santa Fe mine, near Parral. He is down 110 feet and has ore which he will cross-cut at the 150-foot level. At 55 feet he struck native silver.

OAXACA.

P. Gram has a sixty-day option for \$320,000 on a gold and silver group 8 miles south from Etzatlan.

G. D. Truth and M. B. Katze have an option on a petroleum prospect 6 miles from Etzatlan and 2 miles from the railroad for \$125,000. Development work will begin next week.

F. W. Harrell has bought the Candelaria, Patrocina and San Pedro mines, 6 miles from Etzatlan. They carry gold and silver.

Near Oaxaca, La Escudra group of mines has been sold to an American company (La Escudra M. Co.), who will put in machinery.

SONORA.

(Special Correspondence).—The La Dura M. & M. Co., operating the Prietas mine, are doing development work in the central shaft, down 800 feet, and will sink to 950 feet. When connections are made

with the north shaft, all the ore will be taken out through the central shaft, which has double compartments, equipped with cages, double-drum hoist and air compressor. Air drills are used. The first-class ore is packed to the railroad, about 100 miles distant, for shipment to the smelter. The second-class ore is taken to the mill for treatment. The Gloria mine, which the above company is operating, has an incline shaft over 1000 feet deep, taking out about 200 tons per month. The ore is handled the same as the ore from the Prietas. The Gloria is 1 mile from the mill and the Prietas 2½ miles distant. The ore goes through crushers and revolving screens to jigs and tables. They have twelve jigs in use and two round tables. The ore is rich in silver. P. Schabrum is superintendent, A. S. Graff assistant superintendent.

La Dura, March 18.

(Special Correspondence).—The Bufo M. & S. Co., at Bufo, is putting in a concentrating plant and reverberatory furnaces and will ship high-grade matte instead of concentrates. At present they are working the ore by the lixiviation process. The high-grade ore is shipped without concentrating. At present they are developing the Bufo property. The company has been in operation the past five years and has paid all expenses from the mine. They are 160 miles from the nearest shipping point. Everything is packed in and all ore packed out. The company is putting in a pumping plant. D. Richardson is president, F. Richardson secretary, W. Richardson general manager, E. George acting superintendent, E. M. Clark metallurgist.

La Bufo, March 19.

(Special Correspondence).—Los Coches mine, at Los Coches, has one shaft down 120 feet, one 84 feet and one 70 feet. The vein is from 5 to 8 feet wide. The ore is quartz carrying gold and silver, averaging \$15 per ton. They have a steam hoist, pump, etc., on the property. They will erect a 20-stamp mill. W. J. Burdick is superintendent.

Los Coches.

(Special Correspondence).—The Yaqui S. & R. Co. is erecting a 125-ton custom smelter and refinery at Toledo, a new camp on the Yaqui river at San Antonio, 90 miles east of Torres. The smelter site is on the west bank of the river, in the heart of a rich mining section, and within 6 miles of coke and anthracite coal mines. Water will be supplied from the river. Foundations for the plant are completed and machinery is arriving. The machinery is being furnished by the Allis-Chalmers Co. of Chicago, Ill., and will consist of one 100x36-inch and one 36-inch circular blast furnace, softening and calcining furnaces, Howard zinc stirring machine, etc. All furnaces are supplied with blast from the main blast pipe line. This is provided for burning native anthracite coal. They expect to be in operation within six months. The company owns mines carrying lead, silver and gold. Many properties in the district, too low grade to ship out of the country, are waiting the completion of the smelter, when they will commence active operations. This is the first custom plant of its kind in Sonora. A. E. Klausner is president, J. R. Moorman secretary, H. C. Gerber constructing engineer, F. Davis general manager.

Camp Toledo, San Antonio, March 20.

(Special Correspondence).—The Sunset Development Co. is operating the coal mines at La Barranca, where they have anthracite coal and coke. At present they are supplying the surrounding camps with coal and will furnish the smelter, when completed, at Camp Toledo. They are putting in coal sheds and also intend putting in a chain hoist. H. M. Martin is superintendent.

B. A. Ogden, superintendent of the Las Gateras mine, La Barranca, reports a strike of ore that runs high in silver and 7 ounces in gold.

La Barranca, March 21.

(Special Correspondence).—According to the old records, the Jesuits and Indians took \$4,000,000 out of the Mina Blanca, now owned and operated by La Sonora G. & S. M. Co., at Sauqui Grande, who will erect a concentrating mill and, possibly, a smelter. This mine was worked as early as 1710, and has 4000 feet of tunnels and shafts and a dump of 30,000 tons left by the early workers. The new work was started in November, 1900, and consists of 1200 feet of tunnels and shafts, which cut under the old workings 160 feet. The vein is 16 feet wide, all concentrating and smelting ore, running in silver, copper, gold and lead. They have erected their engine and shaft houses, hoist, etc., and can ship ore at any time. The property consists of seventy-eight acres. Ortiz is the shipping station. J. D. McArde of Minneapolis, Minn., is president, C. E. Wenzel vice-president, F. W. Webster treasurer, F. Chambers secretary, T. F.

Collins superintendent, F. E. Dickinson general manager.

Sauqui Grande, March 20.

In the Yecora district, and near the Chihuahua boundary, a vein of silver ore has been found and is being worked by the Colon M. Co., organized by Chihuahua men.

The El Tigre mine, south of Douglas, Ariz., has been sold to a company of Kansas City, El Paso and Bisbee men for \$650,000 gold. The company has organized as the Lucky Tiger-Combination G. M. Co., with B. F. Graham of Bisbee, Ariz., president, F. M. Sturges of El Paso, Tex., vice-president and manager, and W. J. Morse superintendent. Machinery will be put in and extensive operations begun.

* PERSONAL *

C. F. MAUNDER is superintendent Liberty mines, near Butler, Nev.

J. P. EVANS of the Colorado Iron Works Co. is in Ely, Nevada.

P. G. SAWYER of Kansas City, Mo., is in Douglas, Ariz., on mining business.

J. HOAG of Denver, Colo., has charge of a property at La Dura, Sonora, Mexico.

J. D. DEBEQUE of Santa Eulalia, Mexico, is in Boston, Mass., on mining business.

J. R. FINDLEY is general manager Portland G. M. Co.'s mines at Cripple Creek, Colo.

M. HOUK, president of the Trilby M. & M. Co., near Silverton, Colo., is in the East.

F. W. HARRELL is in New York City, on mining business, from Etzatlan, Oaxaca, Mexico.

A. LEJUNE has returned to Tincup, Colo., from New York City, on mining business.

J. J. MCSORLEY has resigned as superintendent of the Calaveritas mine at Calaveritas, Cal.

L. GINGER, manager Gold Coin mine of San Javier, Sonora, Mexico, is at Colorado Springs, Colo.

E. B. CANNAN has returned to Minneapolis, Minn., from Sauqui Grande, Sonora, Mexico.

J. B. HARRELL goes to Texas Flat mines, Madera, Cal., to take charge of their new mill.

GEO. S. TYLER has returned from San Fernando, Durango, Mexico, and is in San Francisco, Cal.

JOHN R. TREGLOAN of the South Spring Hill mine, Amador, Cal., is in San Francisco, Cal.

R. B. HUGHES, superintendent of the Holy Terror mine at Keystone, S. D., is in San Francisco, Cal.

C. EGAN, manager of the San Marcial Coal Co., San Marcial, Sonora, Mexico, is in San Francisco, Cal.

THOS. J. BARBOUR of the Risdon Iron Works has returned from San Pedro, Cal., to San Francisco.

C. A. AIKEN has returned to San Francisco, Cal., from an examination of mines at Santa Eulalia, Mexico.

F. E. WILSON, manager Friday mine, near Baker City, Or., is in Baker City from Salt Lake City, Utah.

J. SCOBEE, manager of the Pride of the West mine, has returned to Washington, Ariz., from Denver, Colo.

F. MOTT, consulting engineer of the Los Coches mine, Los Coches, Sonora, Mexico, is in San Francisco, Cal.

C. F. MASEY, manager Iron Springs gold mine, near Weiser, Idaho, has returned from a business trip East.

C. CAPP, with S. R. Nickles, mining engineer, have recently examined the Phoenix mine at Sierra City, Cal.

F. H. HUSTED has resigned as president of the Guazapares M. & M. Co., at Guazapares, Chihuahua, Mexico.

C. R. SMITH is manager and superintendent of the Wilson M. & M. Co. at Stein's Pass, Grant county, N. M.

MANAGER STANKOVITCH of the Servian-American G. M. & M. Co., near Redfern, South Dakota, is in the East.

T. F. SINGISER, president of the American Flag mine of Park City, Utah, has returned from a business trip East.

H. W. CROWTHER, manager of the Bluebird mine in Beaver county, Utah, returned to Salt Lake City, Utah, last

week, from Missouri, where he went to report on a nickel-cobalt-lead mine for New York men.

C. L. ROOD, superintendent of the Daly and Ontario mines at Park City, Utah, returned last week from California.

H. C. DAVEY, superintendent quicksilver mines at New Almaden, Santa Clara county, Cal., is in San Francisco, Cal.

MANAGER W. SNYDER of the Western Exploration Co. has returned to Salt Lake City, Utah, from an Eastern trip.

MANAGER W. C. SPICER of the Yreka C. Co., at Quatsino, B. C., has returned from Victoria, B. C., on mining business.

H. E. CAREY, who has been in Mexico for several months on mining business, returned to Salt Lake City, Utah, this week.

B. A. CARDWELL has resigned as manager Siskiyou M. & D. Association, at Yreka, Cal., and will go to Denver, Colo.

W. S. WEYMOUTH is superintendent of the Commodore mine, on Barkhouse creek, near Oak Bar, Siskiyou county, Cal.

W. M. ORR, formerly of Salt Lake City, Utah, is chief chemist for the MacArthur-Forrest Syndicate, with offices in Denver, Colo.

C. WALL is master mechanic at the Crestone-Colorado mine, La Colorado, Sonora, Mexico, vice J. W. Goodman, resigned.

J. MAY, formerly with the Valadena Co., Durango, Mexico, is assistant manager Gold Coin Co., San Javier, Sonora, Mexico.

F. A. GOURLEY of Nevada City, Cal., is superintendent of the Calaveritas mine at Calaveritas, Cal., vice J. J. McSorley, resigned.

W. A. FARISH of Salt Lake City, Utah, manager of the Majestic M. Co., near Milford, Utah, is in the East on mining business.

J. L. SHEPHERD, president of the Tril-metallic S. & R. Co. of Nogales, Ariz., is in Ohio on business connected with his company.

MESSRS. YAMADA, president, and Koda, secretary, of the Hoden Oil Co. of Japan, are examining the oil fields of southern California.

W. PARKER, manager Maggie Gibson Dredging Co., near Virginia City, Mont., has returned from an extended visit to Chicago, Ill.

E. L. DOHENY of San Francisco, Cal., president Mexican Petroleum Co., is examining the company's holdings at Tampico, Mexico.

W. BOSTWICK of New York is president of the Guazapares M. & M. Co., at Guazapares, Chihuahua, Mexico, vice F. H. Husted resigned.

J. W. GOODMAN, for a number of years master mechanic at Crestone-Colorado mine, La Colorado, Sonora, Mexico, has resigned and gone East.

SUPERINTENDENT F. J. HARRINGTON of the Quartette M. Co., at Searchlight, Nev., returned this week from a short trip to Los Angeles, Cal.

T. A. VARDEN, recently foreman De Lamar Gold Mt. mill, San Bernardino county, Cal., is now foreman Pine Hill mill, Nevada county, Cal.

L. E. AUBURY, State Mineralogist of California, has returned to San Francisco, Cal., from a visit to the oil fields in the southern part of the State.

D. H. JACKSON, formerly of El Dorado county, Cal., and later of Tonopah, Nev., is now permanently located at 1019 North American Building, Philadelphia, Pa.

F. BETTLES, metallurgist for the Newhouse Co., returned last week to Salt Lake City, Utah, from an inspection of the Hannapah mine, near Butler, Nev.

W. B. THOMPSON of the Thompson Investment Co. of Boston, Mass., is in San Francisco, Cal., from Clifton, Ariz., where he has been examining mining property.

A. M. SMITH, formerly foreman Nevada Reduction Works, Dayton, Nev., has gone to Punta Arenas, Central America, where he will have charge of a large milling plant.

F. L. BROWN, formerly assistant superintendent Tacoma smelter, Tacoma, Wash., is in charge of the laboratory and analytical work for the Oregon S. & R. Co., at Sumpter, Or.

C. M. FASSETT of Spokane, Wash., is drawing plans for a combination amalgamation and cyanide mill, which will be built this spring for the Bodie M. Co. on the north half of the Colville Indian reservation, 16 miles from Midway, B. C.

Commercial Paragraphs.

THE Ironsides Co., Columbus, O., manufacturers of special lubricants and preservatives for a variety of operating departments, recently held a convention at the Hartman Hotel of that city, at which the greater portion of the sales agents were present. The several day's sessions, which were given to matters pertaining to the various fields, culminated in a banquet. All attendants were greatly benefited through the interchange of ideas and, further, enjoyed all the social features.

THE Brown Corliss Engine Co. of Corliss, Wis., have an order from the Middlesex & Somerset Traction Co. of New Brunswick, N. J., for one 16x30x42-inch horizontal cross compound engine and one 18x34x36-inch vertical cross compound engine, and also an order from the American Locomotive Co., Dunkirk, N. Y., for one 26x42x42-inch tandem compound engine.

A. LESCHEN & SONS ROPE CO., manufacturers of wire rope and aerial wire rope tramways, with headquarters at 920 to 932 North First street, St. Louis, Mo., have opened an office and warehouse at 1717-1723 Arapahoe street, Denver, Colo., where they will carry a full stock of their various grades of wire rope and likewise manila rope, etc. This gives them four branch offices and warehouses in addition to their headquarters at St. Louis, viz., 92 Center street, New York City, N. Y.; 137 East Lake street, Chicago, Ill.; 85 Fremont street, San Francisco, Cal., and the Denver office above referred to. The A. Leschen & Sons Rope Co. manufacture all ordinary grades of wire rope and are also sole manufacturers of Hercules colored strand wire rope and patent flattened strand wire rope. They also manufacture automatic tramways which load and unload automatically, likewise several types of friction grip tramways, also single-line and two-bucket tramways.

Obituary.

H. HALE, formerly engaged in mining near Yuma, Ariz., died March 22 at his home in Tucson, Ariz., of heart failure. Deceased was 61 years of age and a veteran of the Civil War (12th Iowa Infantry). He served one term as assistant superintendent of the territorial prison and was elected to the lower house of the Legislature from Yuma county in 1896.

Catalogues Received.

Catalogue No. 5 E of the Colorado Iron Works of Denver, Colo., is a neat illustrated pamphlet on concentration of ores of all kinds by the use of the Bartlett table.

New Patents.

DEWEY, STRONG & Co's SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MARCH 24, 1903.

723,227.—**TOY GUN**—Mark Anthony, Oakland, Cal.
723,513.—**FUMIGATOR**—G. E. Brown, Selma, Cal.
723,545.—**JAR CLOSURE**—W. E. Brown, Los Angeles, Cal.
723,440.—**FEED WATER REGULATOR**—Casey & Standehach, S. F.
723,241.—**ENGINE BOILER**—C. E. Chambers, San Jacinto, Cal.
723,243.—**CONCRETE FLUME MACHINE**—C. R. Cook, Chicago, Cal.
723,373.—**NET**—Duryea & White, Los Angeles, Cal.
723,517.—**ROLL PAPER PRINTING MACHINE**—G. H. Dworzek, S. F.
723,458.—**RELIEF VALVE**—E. R. Graham, Bakersfield, Cal.
723,602.—**FLANGING CAN BODIES**—H. L. Gushner, Ch. Cook, Wash.
723,773.—**ANIMAL TRAP**—Harter & Brown, Riverside, Cal.
723,672.—**TOBACCO PIPE**—F. Holland, Porterville, Cal.
723,676.—**PUMPING APPARATUS**—D. W. Jones, S. F.
723,471.—**TELEPHONE RECEIVER HOLDER**—G. Konigstein, S. F.
723,474.—**HARVESTER**—W. C. Matteson, Stockton, Cal.
723,495.—**DREDGER**—R. A. Perry, Oakland, Cal.
723,545.—**HOLSTER**—R. M. G. Phillips, Los Angeles, Cal.
723,305.—**B AS CUTTER**—T. B. Reardon, S. F.
723,49.—**POLE AND SHAFT**—G. A. Schenck, S. F.
723,411.—**GAS GENERATOR**—A. Schewitzer, Glendora, Cal.
723,496.—**CRYSTALLIZING**—G. E. Stadtger, S. F.
723,417.—**SPEED GOVERNOR**—C. E. Sterns, San Diego, Cal.
723,497.—**PICTURE FRAME**—C. H. Strauss, Port Gamble, Wash.
723,498.—**PUZZLE**—L. A. Svenson, Oakland, Cal.
723,436.—**BUILDING**—L. B. Valk, Los Angeles, Cal.
723,427.—**WATER ELEVATOR**—B. Van Cleave, Echo, Or.
723,566.—**CRYPTOGRAPH**—L. H. Weston, Holbrook, Or.
723,69.—**PRUNING SHEARS**—J. H. Wiles, Reeburg, Or.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co's SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

POLES AND SHAFTS.—No. 723,492. March 24, 1903. G. A. Schenck, San Francisco, Cal., assigned to Hooker & Co., a firm of San Francisco. This invention relates to improvements in metal connections for shafts and cross bars, and its object is to provide a cheap, rigid and durable connection and one which will permit shafts to be knocked down to be changed, so that any desired amount in combination with the cross bar and shafts of a casting secured to the cross bar, upper and lower plates integral with the casting, and between which this shaft is held, dowels integral with the casting and disposed intermediate of said plates, and a bolt intermediate of and parallel with the dowel and extending through the cross bar, the said dowels and plates having coincident perforations.

AUTOMATIC ROLL PAPER PRINTING DEVICES.—No. 723,517. March 24, 1903. G. H. Dworzek, San Francisco, Cal. This invention relates to an apparatus for printing the names, advertisements, or other matter upon roll paper such as is employed for wrapping packages and the like. It consists of a mechanism actuated in unison with the revolution of the roll, whereby a single impression is imparted upon the roll during the first revolution of the roll carrier, and the mechanism is then disengaged, so that any desired amount of paper may thereafter be taken from the roll without further imprint being made.

CRYSTALLIZING PROCESSES.—No. 723,496. March 24, 1903. G. E. Stadtger, San Francisco, Cal. This invention relates to a process for crystallizing rock candy and the like within bottles in which it is desired to produce an inner crystalline coating previous to the filling of the bottles with liquor. It is designed for the preparation of liquors in the form known as "rock-and-rye" or similar compounds. The process consists in the production of a thin coating of crystals granular in sugar adhering to the inner walls of the glass bottles, and in filling the bottles with a thick saturated saccharine liquid, so that the crystals of said liquid will be more readily and evenly started upon the roughened surface thus produced, and also in removing air bubbles from the crystalline surfaces.

DREDGER.—No. 723,485. March 24, 1903. R. A. Perry, Oakland, Cal. This invention relates to an apparatus for dredging material from beneath the water, and it consists in a means for advancing and fixing the apparatus at intervals, so that the excavating device can be made to work over a certain stated space while the apparatus remains stationary, and after this space has been cleared or completed the apparatus can be again advanced and start at a new station. This construction does away with the use of exterior fixtures and guides which have hitherto been placed along the sides of the boat and which are ordinarily very much in the way and which are liable to become cramped if the boat tilts from one side to the other by reason of the swinging of the weight of the excavator to one side or the other.

FUSE SPLITTERS AND CAP CRIMPERS.—No. 723,521. March 24, 1903. J. Fischler, Silverton, Colo. This invention relates to a device especially designed for splitting fuse and crimping caps upon the ends thereof in readiness for use. It consists of a pair of handles pivoted together, the operating end of one consisting of a fuse-splitting blade and one-half of the crimping segment, and by which it is operated to draw the fuse carrying the elastically mounted splitting blocks in conjunction with which this blade operates, and also carrying the other half of the crimping. This side walls of the splitting blocks may also be formed to receive the fuse transversely, so that the same blade will serve to cut it into desired lengths. By means of this tool all the work of preparing fuses and attaching the explosion caps thereon may be easily effected.

RELIEF VALVE ATTACHMENT FOR OIL WELL PUMP.—No. 723,458. March 24, 1903. E. R. Graham, Bakersfield, Cal. This invention relates to improvements in devices for relieving the pressure and preventing sand settling on the pump valve of oil and other wells. It consists of a cylindrical valve casing or cage embracing a section of the sucker rod and adapted to be supported at a suitable point in the well, a conical valve in said cage through which the sucker rod reciprocates and by which it is operated to draw fluid up, and upwardly through the cage, said cage adapted when the valve is closed to support the column of oil above the pump, and means by which this valve may be lifted to allow said column to fall when it is desired to remove the apparatus from the well. This device is applicable to any pump.

AUTOMATIC FEED WATER REGULATOR.—No. 723,440. March 24, 1903. V. F. Casey and J. P. Standehach, San Francisco, Cal. This invention relates to improvements in apparatus by which the supply of water to steam boilers is regulated automatically. It consists of a receiving chamber, a stand water pipe connecting said chamber with the water space of the boiler, a superposed supply chamber, a pipe connecting the steam space of the boiler and the stand pipe below said receiving chamber, valves controlling the admission to and discharge from said chamber, and a float valve therein and mechanism whereby said controlling valves are alternately opened and closed to admit water to the boiler according to the water level in the latter below a predetermined level.

PUZZLE.—No. 723,498. March 24, 1903. L. A. Svenson, Oakland, Cal. The object of this invention is to provide an ingenious and simple toy which will afford both entertainment and instruction, and may be called a "railroad and geographical puzzle." It consists essentially of a series upon which is depicted a map of a State or country, pockets or recesses thereon representing cities of that State or country, each pocket represented by a different color, intersecting grooves representing railroads connecting the cities, and balls representing trains traveling in the grooves, each ball corresponding in color to a particular city, the object being to get the balls into the relatively colored pockets.

HOLDER FOR TELEPHONE RECEIVER.—No. 723,471. March 24, 1903. S. Konigstein, San Francisco, Cal. The object of this invention is to afford a means for relieving the operator of the weariness and cramping of the arm often incident to this holding of the receiver in the hand when carrying on a conversation over the telephones, and it allows both hands of the operator to be

free, at the same time holding the receiver in proper relation to the ear. It is equally adaptable to portable stand telephones or to the wall telephones.

TRAVELING HARVESTER.—No. 723,474. March 24, 1903. W. C. Matteson, Stockton, Cal., assigned to The Holt Manufacturing Co., a corporation, of Stockton. This invention relates to improvements in apparatus designed to cut, thresh, clean and sack grain. It consists in a mechanism which will hereinafter be described and claimed by which the apparatus is enabled to travel upon sidehills and maintain the body of the threshing and cleaning machine in a horizontal position and the wheels in a vertical position at all times, whatever may be the inclination or variation of inclination of the ground upon which the machine is working. The object is to enable a traveling harvester and thresher to be used upon sidehills of any description and maintain the frames of this thresher and cleaner at all times in a horizontal position and at the same time maintain the harvesting wheels in a vertical plane.

Latest Market Reports.

SAN FRANCISCO, April 3, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22½d (standard ounce, 925 fine); New York, bar silver, 49½c, refined (1000 fine); San Francisco, 49½c; Mexican dollars, 38 @39c San Francisco, 38½c New York.

COPPER.—New York: Standard, \$13.75; Lake, 1 to 3 casks, \$14.75@15.00; Electrolytic, 1 to 3 casks, \$14.75@15.00; Casting, 1 to 3 casks, \$14.25 @15.00; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £63 17s 6d spot per ton.

Exports of copper for the month of March were 12,840 tons, against 20,012 tons for same month last year. For the first three months of 1903 the total export of copper has been 23,354 tons.

LEAD.—New York, \$4.67½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £12 12s 6d per long ton = 2.74½c per lb.

SPELTER.—New York, \$5.65; St. Louis, \$4.60; London, £23 5s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$30.00@30.05; San Francisco, ton lots, 32c; 500 lbs., 32½c; 200 lbs., 32½c; less, 33c; bar tin, 3½c, 35c @37½c. London, £138 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 @oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 21c; San Francisco, Plumbers', 100-lb. lots, 17.65c.

NICKEL.—New York, 50@60c @ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.10; gray forge, \$20.50; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	\$23 50@24.50
Foundry Northern 1	23.00@24.00
Northern 2	22.50@23.50
Northern 3	22.00@23 00
Southern 1	23 35@23 85
Southern 2	22 85@23 35
Southern 3	22 35@22 85
Forge	21.85@22 35
Charcoal	26.00@27.00
Billets, Bessemer	33.00@34.00
Bars, iron	1.90@1.95
Bars, steel	1.75@1.80
Rails, standard	28.00@30.00
Rails, light	34.00@40.00
Plates, boiler	1.90@2.00
Tank	1.75@1.90
Sheets, 26 store	2.90@3.00
No. 27	3.00@3.10
No. 28	3.10@3.20
Angles	1.75@
Beams	1.75@
Tees	1.80@
Zees	1.75@
Channels	1.75@
Steel melting scrap	18.50@19.00
No. 1 railroad wrought	20.00@20.50
No. 1 cast, net ton	18.00@19.00
Iron rails	24.00@25.00
Car wheels	24.00@24.50
Cast borings	10.50@11.00
Turnings	14.50@15.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher;

redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8. Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8 50, long ton.

OILS.—Lined, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50@55c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c @ lb.; carloads, 24@24½c; in tins, 35c; soda ash, \$2.60 @100 lbs.; hyposulphite of soda, 24@26c @ lb.; caustic soda, in drums, 3@4c @ lb.; Cal. a. soda, bbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 8c; caustic potash 10c in 40-lb tins; borax concentrated, 7@8c @ lb.; roll sulphur, 4@6c; powdered sulphur, 2@3c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2@2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5@7c; chloride of lime, spot, \$3.00@4.00; sulphuric acid, in carboys, 66% B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ¾c per lb. above keg price; in 5-lb. tin cans, 100 lbs. per case, ¾c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb. powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ lb.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5@7c.

MANGANESE.—(90% and over) ¾ oz., \$1.25.

MOLYBDENUM.—25c @ gramme; 1000 grammes = 2½ lbs.

CHROMIUM.—(90% and over) per lb., \$1.25.

SODIUM.—Metal, ¾ lb., \$1.25.

MERCURY.—Bichloride, ¾ lb., 90c.

PHOSPHORUS.—(American) ¾ lb., \$1.00.

SILVER.—Chloride, ¾ oz., 90c@1.00; nitrate, 55c.

URANIUM.—Oxide, ¾ lb., \$3.50.

ZINC.—Metallic, chemically pure, ¾ lb., 50c; dust, ¾ lb., 10c; sulphate, ¾ lb., .04c. (These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

MINING AND SCIENTIFIC PRESS

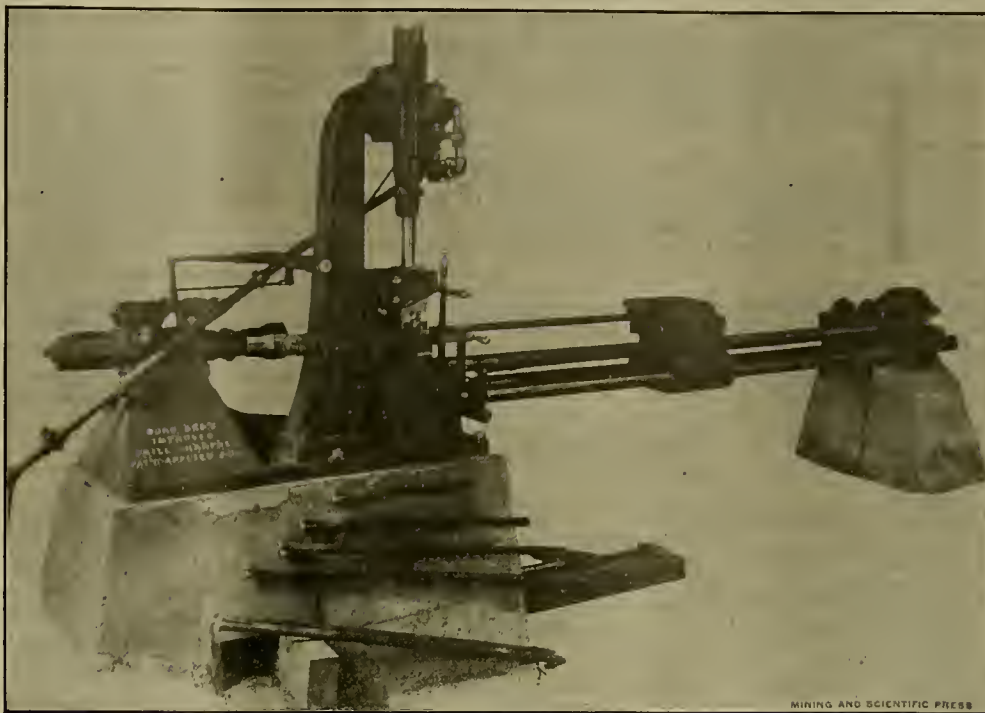
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Drill Sharpening Machine.

Among recent devices for economizing the expense of mine operation are the power-driven drill sharpening machines. One of these ingenious mechanisms, invented and patented by Word Bros., accomplishes the ordinary work of several hand drill sharpeners and is operated by a single man. The machine possesses a number of unique features aside from its speedy operation. It forges a chisel bit for hand work or a cross-bit for machine drilling with equal speed and facility, upsetting the heated steel and forging it into a finely-formed bit of the desired shape and size. It dispenses with the "cross steel," usually welded onto machine drills, thereby doing away with the expense of cutting the heavy cross bars and welding them to the drill shank. The machine is complete within itself and will make bits of all sizes from $\frac{3}{4}$ -inch to 1 $\frac{1}{2}$ -inch steel without change in dies. It has been estimated that one man can make from the new steel bars 500 finely finished drills, unaided, in ten hours. In making a drill from new steel, or reforming and sharpening drills from the mine, no matter what their condition, broken or otherwise, no cutting off or loss of material is necessary. The first Word drill was made and operated at the Franklin copper mine, near Houghton, Mich., where it has been in use for several months. Another machine has been in constant service at the Black Oak mine, at Soulsbyville, Tuolumne county, Cal., for more than six months. Concerning it the superintendent, W. G. Scott, says: "The machine ran 183 days with nominal repairs. Average hours run daily, 4; total, 732 hours. One man operated the drill, attended his own forge and made necessary repairs. Any man who can set up and run a machine drill can run the drill sharpener. Approximate number of drills upset and sharpened, 36,000; average, 50 drills per hour. Fuel used is less than one-half that required in hand work. One and one-half minutes are required to form and sharpen a new drill. Over sixty drills have been repointed by this machine in one hour. The life of a bit sharpened by this drill is longer than when done by hand, the bits being better formed and more compact, taking a better and more even temper. The different-sized points are made with uniformity. By a change in the dies the machine will sharpen hand drills. Before we used this machine we employed two drill-sharpening blacksmiths and two helpers to make and sharpen drills. The saving of the machine over hand labor in six months has been \$1738.50; saving on coal (183 days), \$183; or a total



Drill Sharpening Machine.

saving for six months of \$1921.50." The drill is set up and working at the establishment of the Compressed Air Machinery Co., 24-26 First St., San Francisco, Cal., who are the agents and sole manufacturers of the machine. The accompanying engraving illustrates the drill sharpening machine, showing its general construction and method of operating.

The Machine Drill.

One of the difficulties which manufacturers of machine drills have to face is the lack of knowledge, mechanical skill and common sense on the part of some of the men who run their drills in mines. A machine drill is an engine carefully constructed of steel and iron, but no other type of engine made is required to stand the abuse that falls to the lot of the machine drill. Carelessly set up, fitchered holes often result, and then the chuck tender beats the drill bar with a wrench or hammer in the hope of causing the drill to become loosened, and often this has the desired effect; but if a few blows fail to ac-

complish this, he aims a heavy blow at the chuck, as many a battered chuck will testify. Now and then a man who ought to be breaking rocks in a quarry, instead of tending chuck in a mine, misses the chuck altogether and breaks the flange of the drill carriage. Neglect to oil the machine results in the piston cutting; and when this once occurs, it is more likely to reoccur, often ruining a new machine before the damage is discovered. A first-class machine man is worth the highest wages paid to miners, but a poor one is a constant source of expense. Before men are given the highest wages to run a machine drill, they should be required to demonstrate their ability to properly handle and care for the drill and to accomplish a reasonable amount of work with it.

The making of machine drill miners out of chuck tenders of two weeks' experience, who have risen recently from the ranks of the muckers, is a mistake and is a direct reflex on the mine superintendent. Machine drills are an advantage in almost every mine, in drifting and stoping, though there is much difference of opinion as to their economy in shaft sinking. The smaller machines—2 and 2 $\frac{1}{2}$ inches—are advisable in small stopes and raises and the large machines—3 $\frac{1}{2}$ to 3 $\frac{3}{4}$ inches—for drifting and in large stopes. Some object to the employment of large drills in stopes, owing to the loose character of the ground, and the fact that the heavy concussions of the drill shake down the ground while drilling, rendering the work extremely dangerous. This is entirely a matter of judgment on the part of the superintendent or foreman. If the ground be hard enough to warrant the employment of the large machines, it will usually stand well enough; but heavy charges of No. 2 powder in this hard rock may loosen and fissure the rock extensively, while not breaking it down, and in this way make the ground dangerous for the drillers on the next shift. In such cases the employment of 2 $\frac{1}{2}$ -inch machines, with at least 100 pounds of air, and the use of No. 1 powder will generally obviate the danger. As previously stated, this is a case for the exercise of the judgment of the superintendent, as no two cases are exactly alike, but experience will suggest the proper course to pursue. In using the smaller machines a drill runner, if experienced, can dispense with the aid of a chuck tender. If two machines are run in the same face, the machine runners can assist each other in setting up, each then running his machine singly.



Surface Works, McNamara Mine, Tonopah, Nevada.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Drill Sharpening Machine.....	225
Surface Works, McNamara Mine, Tonopah, Nevada.....	225
Method of Classifying the Ore in a Mine.....	228
Weston's Direct Reading Voltmeter.....	231
Pump Repaired With Smooth-On at U. S. Navy Yard, N. Y.,.....	231
Bird's-Eye View of Tonopah, Nevada.....	232-233
Mining and Metallurgical Patents.....	234
EDITORIAL:	
Drill Sharpening Machine.....	225
The Machine Drill.....	225
Mine vs. Mill Samples.....	226
A Desert Rush.....	226
Up-to-Date Survey.....	226
Ratio Between Gold and Silver.....	226
Gilsonite-Bearing Lands in Northeastern Utah.....	226
To Arbitrate the Strike of Colorado City Millmen.....	226
The Waihi M. Co. of New Zealand.....	226
MINING SUMMARY.....	235-236-237-238-239
LATEST MARKET REPORTS.....	240
MISCELLANEOUS:	
Concentrates.....	227
Mining Engineering in the Valuation of Mines.....	228
Is Siderite Magnetic?.....	229
Improvised Ventilating Machinery.....	229
Crude Oil as a Fuel.....	230
Milling at the Camp Bird, Colo.....	231
The Weston Electrical Measuring Instruments.....	231
Smooth-On Iron Cement.....	231
Late Improvements in Copper Smelting.....	232
Tonopah, Nevada.....	233
Assaying Cyanide Solutions.....	233
Mining and Metallurgical Patents.....	234
Books Received.....	239
Personal.....	240
Commercial Paragraphs.....	240
Obituary.....	240
New Patents.....	240
Notices of Recent Patents.....	240

Mine vs. Mill Samples.

Car samples, feeder samples, samples dipped from the mill battery, and others taken in this haphazard fashion, can only give approximate information, though, on the theory that, "taken at stated intervals, the several samples will average up." These methods are much in vogue, and may be employed as a rough check on mine samples. The latter, if properly taken, should give a more reliable result. Where the ore bins in mills have large capacity, ore sampled at a given date may not reach the stamps for two, three or four days, so that average results only are obtainable by this method, at best, but the monthly average should check fairly well with results obtained in bullion and tailings. The mine sampler takes his samples from the working faces in the mine daily. He estimates as closely as possible the number of tons of ore taken from each place, whether drift, winze, raise or stope, and enters the results in a book kept for the purpose. This is repeated daily, until at the end of the month the sheet shows the estimated number of tons broken daily from each portion of the mine, with its assay value. These in the aggregate give an approximate idea of the amount of ore broken and sent to mill, together with its value.

The amount of ore estimated as broken may be checked at several points along the line on its way to the reduction works. First, the number of cars trammed to the shaft; second, if skips are in use the number and capacity of skips hoisted will afford a check on report of the trammers; third, the number of cars sent from the bins at the shaft to the reduction works, and lastly, the estimated average capacity of the mill or smelter. While in practice it is found that none of these agree exactly, they harmonize sufficiently well to afford a valuable estimate of tonnage and value of headings, which approximates fairly close to the actual result.

Tailings samples are as important, and even more so than headings samples, and these should be the mill man's standby, for in them the mill foreman finds a check on what is being accomplished, and facilities should be provided in the assay office to get tailings assays as promptly as possible after samples have been taken. Particularly is this the case at a mine

where the values are not distributed with uniformity. Where this condition obtains an effort should be made to send the rich and poor ore to mill in such amount as to keep the average grade as nearly even as possible, or the rich ore should be worked separately in certain batteries. There is little satisfaction in the knowledge that the mine produces rich ore, but that the greater part of the values pass down the tail race. The construction and operation of expensive auxiliary plants for treatment of material which could have been made to give up its values in the ordinary process of milling, is expensive economy. Wherever possible the values should be obtained direct, and not by subsequent treatment. The mill man can never afford to feel satisfied until he knows from his tailings samples that he is doing the best work that can be done, or if he can, the manager cannot. The mill man who to-day is in the rut of "old times" methods must needs have a care that a younger man, with broader ideas of modern practice and a desire to apply them, does not displace him. No mill man need fear a new device being placed below his mill in the tail race when he knows from properly taken samples that his tailings are worthless. The bullion produced and the values lost in tailings afford a true statement of values, and tonnage may be ascertained by actual weighing of each car of ore, if it be desired.

A Desert Rush.

Old mining districts often develop surprises in the way of new discoveries. The latest in this direction is the discovery of placer gold in the broad drainage running southeasterly from the New York mountains to the Colorado river, in eastern San Bernardino county, California, known as the Sacramento wash. The wash is dry, excepting in time of heavy rains, which are infrequent. It drains an area of several hundred square miles, in a gold region, and the announcement that dry placers have been found is not surprising. The gold veins of the Exchequer district, north of Homer station, those at and near Ibox and numerous other districts in which it has been known for years that gold veins occur are tributary to this drainage, and as some very rich gold quartz has been found in these districts at various times, coarse gold may occur in certain localities. Whatever may be the value of the newly reported discoveries, the claims are likely, as a whole, to be disappointing, though, as usual, a few may do well. The region is typically desert—coarse sand, with scattering cobbles, and an occasional boulder, sparsely scattered sage brush and Spanish bayonet, with here and there a tuft of gamma grass. Water is scarce and only obtainable by sinking wells in favorable spots, as springs are few. In summer the heat is intense. In fact, it is not a country to invite residence, and nothing but a "gold rush" would induce men and women to tempt fate in going to such a place. Dry placers in the desert region are much the same everywhere.

The gold freed from its matrix in the vein by disintegration is moved downward on the slope of the hill together with the crumbling rocks. Heavy rains carry the detritus to the valley, leaving the rocks bare, an easy prey to further disintegration from extremes of heat and cold, tempestuous winds and torrents of rain. All of the drainage channels of the region are torrential and the large amount of water quickly collects during one of the downpours characteristic of the desert, and moves great volumes of the accumulated debris onward to a lower level. These streams subside almost as quickly as they form, and in an hour or two the fierce heat of the sun has evaporated every drop of surface moisture. To these extremes are due the arid appearance of the valleys, and the sharp, rugged outline of the hills. In some instances where the gold-bearing veins occur in low ridges, which barely project above the desert level, if the quartz be rich in gold, a good dry placer is likely to result in the immediate vicinity where the wash covers the rocks and extending out beneath the surface. In numerous desert districts large amounts of gold have been found under similar conditions, as in the Cargo Muchacho mountains, San Diego county, Cal., at Red Rock and Goler, Kern county, Cal., and in Western Australia, where conditions identical with those described occur. These dry placers not only occur in the valleys, but in the mountain slopes

and tops, as at Antelope and Rich Hills in Yavapai county, Ariz. The discovery of such districts always stimulates prospecting and usually leads to the discovery of other districts, remote from the original.

Up-to-Date Survey.

The latest notice issued by the United States Geological Survey announces that there is now in press for immediate publication Bulletin No. 213, which will be a report of the contributions to economic geology in 1902. This is somewhat of a new departure in the work of the Survey which will be greatly appreciated by mining men.

In some cases in the past reports on important districts have been unavoidably delayed and the mines have been in some cases worked out and the public interest has waned before the reports were issued, when they were practically ancient history. Director Walcott of the Survey has undertaken to meet the popular demand for prompt information from a reliable source. Among important papers in the forthcoming bulletin will be "Investigation of Metalliferous Ores," by S. F. Emmons; "Placer Gold Mining in Alaska in 1902," by A. H. Brooks; "Gold and Pyrite Deposits in the Dahlonega District, Georgia," by E. C. Eckel; "Ore Deposits of Tonopah and Neighboring Districts, Nevada," by J. E. Spurr; "Ore Deposits of Butte, Montana," by W. H. Weed, and "Lead, Zinc and Fluorspar Deposits of Western Kentucky," by E. O. Ulrich and W. S. T. Smith.

AN effort is being made to establish a fixed ratio between gold and silver. The ratio of 32 to 1 has been suggested, but it is thought some higher ratio may be adopted. Under the stimulus of the purchase of a large amount of silver by the Government for Philippine coinage the price has advanced the past week, and under the continued demand will probably go above 50 cents per ounce, but unless some fixed ratio can be established the price of the metal will continue to fluctuate as heretofore. At 55 or 60 cents per ounce, and the expectation that the value might remain fixed at that indefinitely, silver mining would receive a stimulus and many plants and mines now idle would be rehabilitated and operate at a profit.

THE Government by Act of Congress has opened to location the gilsonite-bearing lands in northeastern Utah, reserving the odd sections. Locations made prior to 1891 will be recognized, those made since that date being rejected. The mineral claims which are recognized by the Government must be relocated and the locations perfected within ninety days from the passage of the date of the Act. Locations made subsequent to 1891 are subject to relocation by the first party on the ground. The gilsonite district, which is in Uintah county, is at present the scene of unusual activity. One company, it is reported, claims 112 locations, which they are now busily engaged in perfecting.

EFFORTS of the advisory committee, appointed by Governor Peabody of Colorado to arbitrate the strike of the Colorado City millmen, has resulted in bringing about an amicable settlement of the difficulty and the mills are again running. The mines of the Cripple Creek district, which were obliged to suspend operations by reason of having no market for their ores, have also resumed work. This strike lasted forty-five days, from February 14 to April 1, during the latter part of which time the mining industry of Cripple Creek was almost at a standstill. The strike originated over the discharge of certain union millmen whom the manager refused to reinstate.

FOR several years past the Waihi Mining Co., of Waihi, New Zealand, has been a prominent operator in the dry-crushing cyanide field. During 1902, however, a change was made to the wet-crushing system and recent reports from the management of that property indicate a notable increase in bullion output and higher saving of values, showing the advantage, in that case, of wet crushing over dry. That similar results are obtainable in every other instance where the two methods are tried is not likely. The cyanide process is essentially one of experimentation, until the best possible results are obtained.

CONCENTRATES.

BARIUM OXIDE is manufactured by E. de Haven, at List, near Hanover, Germany.

MUNTZ'S METAL is 38% to 40% zinc and 62% to 60% copper and is easily attacked by sea water when made of pure zinc and pure copper. When it contains 0.2% iron or nickel it is more resistant.

A **CONVENIENT** method of testing a molybdenite ore is to dissolve in nitric acid, filter, make solution alkaline, and add an excess of lead acetate, filter off lead molybdate and determine lead in same by any of the trustworthy volumetric methods.

In many mines skips for bailing are preferred to pumps, as bailing more economical. They may be run tandem where there is room in the head frame, and where this is possible a large amount of water can be handled cheaply.

THE presence of sulphuric acid in water may be detected by the use of blue litmus paper which it turns red. Barium chloride is also used to detect sulphuric acid. When barium chloride is added to water containing sulphuric acid an insoluble precipitate is formed (barium sulphate).

MILL TAILINGS are not usually suitable in the making of concrete, as they generally contain sulphide minerals, which on oxidation will tend to disintegrate the mass. Moreover, they are usually too fine. A coarser sand is better for the purpose, and can be obtained by screening creek sand.

ACTUAL OR BRAKE HORSE POWER is the power the engine develops for use; indicated horse power depends, in fact, upon the efficiency of the engine. Nominal horse power is usually understood to mean the power developed with sufficient surplus to enable the engine to continuously run at that load.

A **RETAINING WALL** can be made stronger if the several courses are laid so as to have an inclination inward toward the bank it is to support. The base of the wall should also be broader than the upper portion of the wall. Where rock is to be supported often a dry wall will answer as well as masonry.

THE Dalmatia mine in Kelsey district, El Dorado county, Cal., in 1888 is believed to have been the first mine to be equipped with electric power in that State. Water from Rock creek ditch was utilized to drive a Pelton wheel, which ran a dynamo of 120 H. P. The current was transmitted 1 mile to the Dalmatia works and 1½ mile beyond to the Gopher Boulder.

GILSONITE, which is also called uintabite, is a hydrocarbon compound occurring near Fort Duchesne, Utah. It is brittle and has a black color with brilliant luster. It fuses readily in the flame of a candle and burns like sealing wax. Elaterite is a soft hydrocarbon compound, being elastic bitumen, resembling india rubber, and of considerable commercial value.

It is not always possible to identify a surface rock that has been much altered by oxidizing, though familiarity with certain rocks make it more easy to recognize them. Diorite and diabase, hard, tough rocks when in normal condition, often weathers to soft, decomposed masses of brownish color, wholly unlike the original rock; yet miners familiar with both are not likely to be mistaken.

THERE are in California several thousand Chinese laborers, some of whom find employment in the mines, but of these comparatively few are employed by American companies. The greater number work for Chinese companies or individuals, or work in placer mines for themselves. The total number of Chinese thus employed, however, does not probably exceed 3000 out of a total of 18,000 miners in the State. Of these very few work underground, being mostly employed in the large hydraulic mines in the northern counties.

A **SMALL** machine drill will not cut as many feet in hard ground in a given time as a large one, but the cost of operating a small machine, for wages, consumption of air, cost of repairs, etc., often make drilling with the smaller machine really less expensive than with the large ones, and the general result more satisfactory in underground mining operations. In driving tunnels of large size through hard rock and in extensive quarry work the larger drills are preferred and do cheaper work.

MATTER assumes various forms, but these may be reduced to two classes, namely, solids and fluids. A solid is a body which offers resistance both to change of shape and to change of bulk. A fluid is a body which offers little or no resistance to change of shape. The fluids may be subdivided into two types, liquids and aeriform bodies. Liquids are those which resist forces having a tendency to increase their bulk, as well as those tending to diminish it. Liquids are practically incompressible into a lesser volume. Aeriform bodies are those which

oppose any force tending to diminish their volume, but do not resist those which tend to increase it. A liquid can be poured in drops, but an aeriform fluid cannot.

BEGINNING at Gold Bluff, in the extreme northwestern part of Humboldt county, Cal., continuing past Crescent City, Cal., and to Port Orford, Or., is the ocean district most profitably worked in that section for gold beach sands, the ocean acting as a sort of gigantic concentrator, forming fresh deposits and sweeping away old workings. So far as known there has not been any successful commercial effort to utilize the force of the waves in any way in the working of any automatic gold saving device.

COPPER produced by the several mines of the Lake Superior region is not considered of equal value for certain commercial purposes, principally the manufacture of wire. That from the Calumet & Hecla, Tamarack, Osceola and Quincy being considered superior for this purpose; but all of the Lake copper brings a higher price in the market, by reason of its freedom from impurities, than the Western or foreign copper. For some purposes Lake copper is preferred to electrolytic, which is supposed to be chemically pure.

THE amount of gravel that may be moved by a miner's inch of water varies greatly, depending largely upon the character of the gravel and on the pressure of the water, as well as to a certain extent upon the volume of water employed. It is obvious that a large volume of water will move more gravel per inch than a small volume, other conditions being equal. The size and grade of sluices and height of bank attacked are also important factors. An average duty of the miner's inch would be from 2.5 to 3.5 yards per twenty-four hours.

"**OIL INDICATIONS**" are the occurrence of bituminous matter oozing from the rocks; crude petroleum flowing from rock strata; the occurrence of an outcrop of sand, shale or other formation, known to be oil bearing in depth, by having been penetrated by wells. A district may be known to be underlain by oil bearing strata, though there are no oil-bearing strata exposed within the district. Petroleum occurs in rocks of almost every geological age, from lower Silurian to recent. Shales, sands and sandstones are the most prolific producers of oil, though limestone also is sometimes oil bearing.

IN the "electrical ore detector" of Daft & Williams, the secondary current of an induction coil is taken to two iron rods which are stuck into the ground to a depth of 2 inches at a distance apart of 400 yards. It is argued that the presence of a mineral vein of higher conductivity than the average ground changes the electric waves radiated from the rods. When two other rods, connected to a telephone, are moved about, any change is made audible, and in this way lead and zinc ores are claimed to have been located in Wales and hematite in England. Similar unauthentic claims have been made for like contrivances.

A **PUMPING ENGINE** such as described by the Breckenridge, Colo., Inquirer would give precisely the same service against a hydraulic bank that a stream of the same quantity of water under the gravity head corresponding to the pressure of the engine would give. Practically, however, one would not or should not use the pumping engine to pump directly against the bank. In hydraulic mining a constant stream is not kept on the bank. One could in the case specified pump to a reservoir and take a separate gravity pressure therefrom. In that way a smaller pumping engine would give the same service that a larger engine used directly could.

MISFIRES are sometimes caused by failure on the part of the men priming the fuses failing to see that the exploding cap is free from sawdust or other foreign substance. When an obstruction in a cap can not be shaken out, or blown out, it is extremely dangerous to attempt to pick it out by means of a pin or other sharp point. Caps once placed on the end of the fuse should be "crimped"—that is, secured to the fuse by firmly pinching the open end of the cap about the fuse. For this purpose a crimper is usually provided. The practice of securing caps to fuse with the teeth is also extremely dangerous.

A **MACHINE DRILL** which has outlived its usefulness in a mine may still be good enough for use in the machine shop or for pounding samples. Mounted on timbers and provided with a suitable pestle, a machine will pulverize a 2 pound sample of hard quartz in about two minutes. It requires a deep, heavy mortar to withstand the blows of the machine, but the facility and speed with which the work may be accomplished suggest the employment of an old drill for this purpose at any mine where a large number of samples are daily taken. The machine also makes a valuable accessory to the blacksmith as a trip hammer, to be used in welding and other heavy work requiring prompt and heavy blows.

APLITE is a type of granite occurring in dikes. It is of uniformly fine texture, and is composed of orthoclase (potash feldspar) and quartz, sometimes some plagioclase (soda-lime feldspar), usually without mica, or with a very small amount of silvery white or greenish potash mica resulting probably from alteration of the orthoclase. Aplite dikes occur in granite, and in some instances the

aplite passes over from that of normal type to a phase in which quartz largely predominates, if not wholly excluding other minerals essential to the normal rock. In some regions dikes of this character have been considered as quartz veins, particularly where they are gold bearing. J. E. Spurr of the United States Geological Survey has named this dike rock "alaskite," from the abundant occurrence in Alaska of veins of this type. It is improbable, however, that quartz veins generally are formed in this manner. It is also a question if the predominant silica were not introduced at a period later than the intrusion of the dike rock, as the gold must also have been.

PROSPECTORS should take steps to inform themselves as to the character of the most important rocks, such as limestone, quartzite, slate, etc., and of minerals which occur most frequently, like quartz, calcite, clay, talc, etc. A knowledge of crystallography is not essential to the prospector, though it is well to know that certain minerals crystallize in particular form—as, for instance, quartz occurs when crystallized in six-sided prisms; galena, fluor spar, pyrite often occur in cubic form; calcite in rhombs, etc. Of course, a thorough course in mineralogy is to be recommended; but a mere smattering of it is not of great assistance to the searcher after gold, copper, lead and zinc. When starting out in the business of prospecting, the miner should learn all he can about the mineral or minerals he intends to look for, their occurrence and physical appearance particularly on the surface, as it is there he will probably make his discoveries, and not underground. Most miners present a very different appearance in the croppings of an ore body or vein from that in the sulphide zone.

CONCRETE, when employed as a foundation for machinery, should be made of the best materials. The proper materials are broken stone, free from dirt; sharp sand, not too fine, and first-class cement. The firmest concrete is made by mixing with just enough water to thoroughly dampen the cement. Too much water retards setting. Where concrete is used in building foundations for stamp batteries, nothing but the best concrete will give satisfaction. The introduction of large-sized stones in the center of the block should be avoided. Soft, crumbling rock is not serviceable. Salt water may be employed in the making of concrete, but retards setting. For one cubic yard of concrete of broken stone and sands without voids requires: 1 cubic yard broken rock with .5 of its bulk voids; .5 cubic yard of sand with 5 of its bulk voids; .25 cubic yard of dry cement. Rammed concrete is stronger than that which has not been rammed. Slow-setting cements are best for concrete. Masonry can not be employed with concrete, as it is likely to crack apart from unequal settlement. The usual formula for concrete is one part cement, five parts broken rock and two parts sand.

TOURMALINE is of several varieties, the most common being the black, known also as jst. The mineral is a complex silicate of boron and aluminum, with also iron, magnesium or alkali metals present. Gem tourmalines are comparatively rare. They are of ruby red color, have a hardness equal to or greater than quartz, and are transparent. Other colors are green, blue, brown, occasionally white or colorless. Tourmalines other than the black variety are strongly dichroic—that is, exhibit different colors when viewed from different directions. Crystals have usually the sides strongly striated in the direction of the longer axis. Often the outer portion of a crystal is one color, as green, while the center is rose red or pink. The crystals are often slender to acicular, and sometimes arranged in radiated groups, as the variety rubellite. Gem tourmalines occur at a number of localities in the United States, notably at Paris and Hebron, Maine; Hemet valley, Riverside county, Cal., and Mesa Grande, San Diego county, Cal. The value of gem tourmalines depends wholly on the color, transparency, freedom from flaw, size, etc. Tourmalines occur in dykes of coarsely crystallized granite, and are generally associated with the lithia mineral, lepidolite.

THE same rules regarding resistance due to gravity apply the same in mine haulage as in any other case where parallel rails are laid. Such resistance varies directly as the grade, and is always twenty pounds per ton, or 1% of the train weight for each per cent of grade. If there is a grade of 1%; that is, an elevation of 1 foot in a distance of 100 feet, the gravity force to be overcome is $\frac{1}{100}$ of 2000 pounds, or twenty pounds. Thus the resistance due to gravity is 1% of the train weight for each per cent of adverse grade. This gravity force is against the haulage going up grade, and in favor of it going down. The other main resistances in mine haulage, or any other kind of haulage on parallel rails, are rolling friction and curvature. In the case of a mine car train weighing fifty tons, the gravity resistance being 1%, the rolling friction resistance 1%, and the curve resistance 1%, the total resistance would be 1.5 tons, and that is the tractive effort or drawbar pull necessary to keep that train in motion whatever be the power. In the case of a locomotive the tractive power or drawbar pull is its pulling strength in pounds, measured by a dynamometer. It is the weight in pounds the locomotive could lift out of a shaft if it took the place of the stationary hoisting engine, providing the locomotive were on a straight, level track, speed not being taken into account. A locomotive will usually develop a tractive power of one-sixth of its own weight.

Mining Engineering in the Valuation of Mines.

Written for the MINING AND SCIENTIFIC PRESS by
G. W. MILLER, E. M., C. E.

The modern mineral industry in all its various scientific phases embraces perhaps a greater number of technical professions than that of any other branch of industry. Among the most conspicuous of these are civil engineering as applied to mining, or "mining engineering" and mechanical engineering as applied to mineral-chemistry or "metallurgical engineering."

Unlike the customs of former years, which included both mining and metallurgy under one head, metallurgical engineering nowadays has assumed the dignity of a profession, and claims the right of occupying a technical field peculiar to itself—distinct from that of mining engineering; nevertheless each of these still, and perhaps always shall, remain, one a

authority to confer upon its graduates any degree in engineering or science. This is not always the case, however, and in many instances members of the profession are found quite as capable as those who possess superior educational advantages. But without wishing to detract from the merit of either class, it may be truly said that a good technical education with lots of practical experience is manifestly preferable to lots of practical experience without a good technical education at the bottom of it.

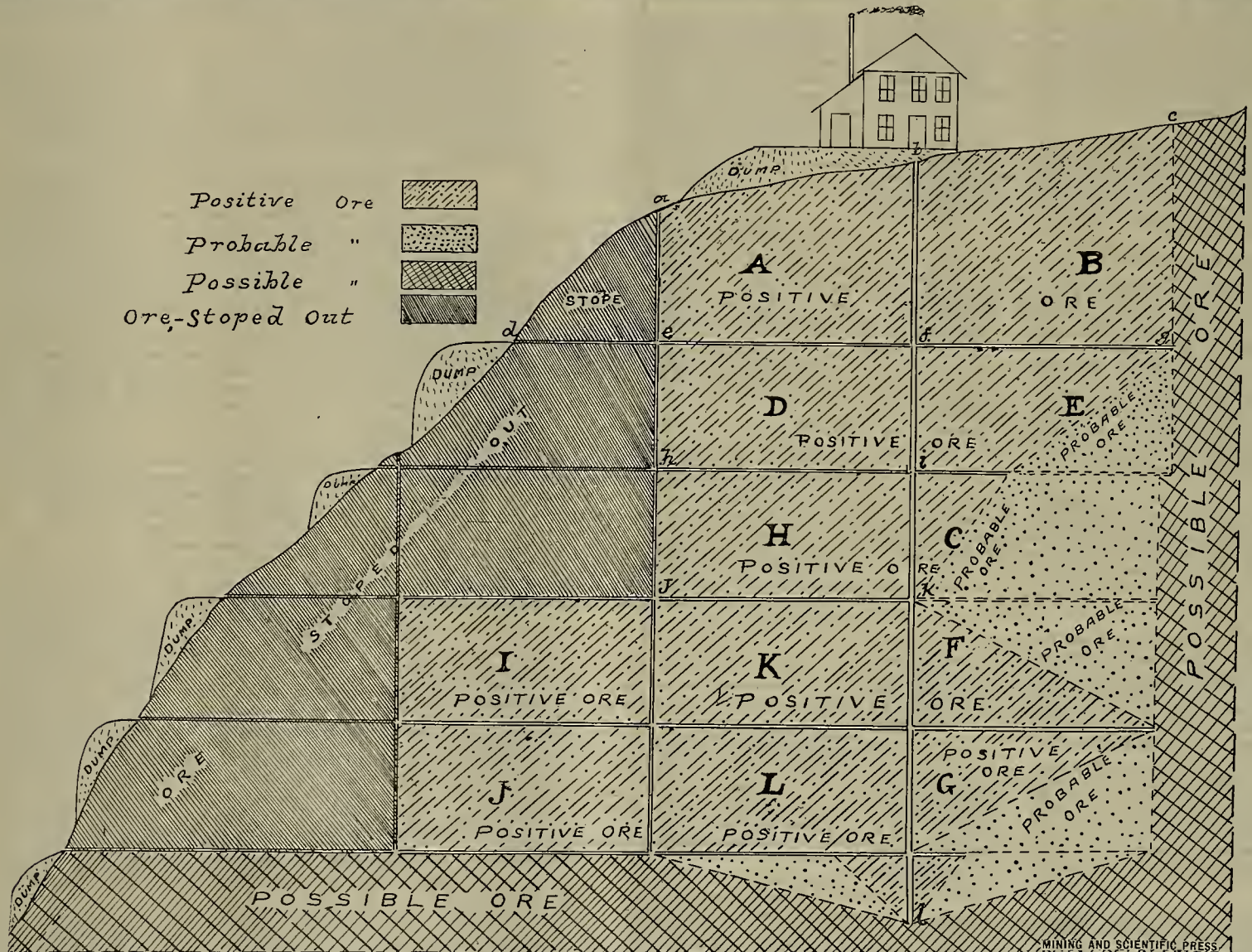
We may include under the following general divisions the prescribed duties of mining engineer proper, viz: (a) Mine examination and valuation; (b) exploration and economic operation of mines. Under division (a) is commonly included that class of the profession who have had wide and varied experience throughout the many mining regions of the world. This class of men are supposed to be well versed in the sciences of mining geology, mineralogy, etc., and hence especially expert in judging a mining property by comparison of its external geological features rather than by means of the more general systematic and expensive routine of sampling its exposed ores, if any. This class of the engineering profession

means well traveled and a good judge of a mine or prospect.

(3) He should be a good mineral chemist, familiar with the fundamental principles of the various ore mills and metallurgical processes, and especially skilled in the work of assaying and making laboratory tests of ores, proving their adaptability for certain metallurgical treatment.

A first-class school of mines places the educational qualifications of its graduates much higher than this, as will be seen from its catalogue. But as thoroughness in practice may be substituted to a certain extent for school training, the above is believed to be all that is necessary under ordinary circumstances.

ATTENDING DUTIES.—Mine operators and investors are not always technically educated mining engineers and in many instances they are quite unable to judge of such enterprises, but it is often required to determine the value of mining properties that such operators and investors already own or contemplate buying. In such cases it is customary to employ some experienced mining engineer, giving him instructions to make such investigations of the property, and procure such data as will enable him to



Method of Classifying the Ore in a Mine.

complement to the other. Some practitioners would include both under one specialty, but in the present stage of advancement of these sciences, we are unable to see how any one man can ever hope to become master of either, much less proficient in both. In the examination of mines, as well as in the operation of the same, the above distinction should be regarded, and it should be borne in mind that technically every man properly belongs to his specialty. All questions, therefore, relating to the final reduction of the ores should be given entirely into the hands of the metallurgist, who will do the rest. By this it is meant that, with regards to any mine examination, the mining engineer's duties should be considered performed and his responsibility at an end when he has designated the "ores," tested their value, and proven their adaptability for certain methods of treatment, and reported the facts as determined, together with all other pertinent conditions affecting the enterprise as an investment or resource.

EDUCATIONAL QUALIFICATIONS.—It is generally concluded that a mining engineer shall, in the first place, be a graduate of some technical school, or of some institution of learning having the lawful

are commonly known as "mining experts," or that class whose specialty is generally limited to that of judging the merits of "prospects" more than in determining the valuation of developed mines. Under division (b) belongs the more technically trained and conservative engineer, or that class of the profession who make the economic operation of "mines" a specialty rather than the geology, history, etc., of the same. This class of men go almost altogether on routine and generally estimate the value of a mining proposition from the basis of values in sight, and hence often err as seriously by undervaluation as class (b) sometimes does by overvaluation. That each class has its sphere of usefulness should not be overlooked, while absolute competence in either case is assured. But as evidence of this, the following prescribed course of training and educational requisites are considered indispensable to a successful career of either class:

(1) The mining engineer should be a thorough, practical miner, trained from boyhood in all the details and methods of underground mining.

(2) He should be a technically educated civil engineer, skilled in the sciences of structural geology, practical mineralogy, mining geology, and by all

pass opinion upon the enterprise as an investment, or a resource, as the case may be. Such instances as these are very trying, as the responsibility is generally very great, often calling forth the highest technical skill; and it is here that the three general requisites above mentioned as constituting a mining engineer's education come into play. It is manifest from the speculative aspect, that must necessarily be considered as forming an important factor in most all mining propositions, that any attempt to place a definite or real valuation upon any given mining property would most likely meet with many questions and endless ridicule, and indeed it might be alleged by some that this could not be accomplished save through purely charlatanic assumptions. But if we will divide or classify into three separate estimates the kind of valuation which it has been found reasonable to place upon any given mining property, the question then becomes a feasible one and can be handled in a legitimate and professional manner. As the valuation of any mine depends upon the value of its ores, the gross value of which is taken as a basis from which all items of expense are deducted, it is manifest that the ores should not only be considered the fundamental representative of value, but

also that these should be termed "ores" only when they will stand such expense deductions and yet show a remaining profit.*

If we will then begin with the ore of a mine, and after sampling and assaying the samples, divide the ore up as follows:

(a) Positive ore, or ore in sight, sampled on three sides.

(b) Probable ore, or ore not fully proven, including also low-grade ores in sight.

(c) Possible ore, or ore reasonably assumed to exist, but not sampled on more than one side.

(See accompanying sketch.)
We shall have, therefore, after deducting all items of expense from the ores, the definite valuation that it is proper to place upon the "mine," expressed in the following terms:

(1) Positive value.....\$	} Total
(2) Probable value.....\$	
(3) Possible value.....\$	
	} "estimated value"
	of mine, \$

In estimating the "positive value" of the mine besides the net value of "ore in sight," the value of all property, machinery, buildings, improvements, etc., belonging to the mine in any way whatsoever, should be considered as a resource, and entered as such in a separate item.

In the estimate of "probable value," the net value of all ores which are known to exist, but which are too low grade to pay at present, but which could be made to pay under certain conditions in the future, should be included; this, together with the estimated net value of all pay ores which are not sufficiently exposed to be classed as "ore in sight" or positive ore, should be entered as forming the "probable value" factor.

The third factor, or that of "possible value," is manifestly a more elastic term than that of "probable value," and both should be kept within due and conservative bounds, more especially the latter. "Possible value," of course, will depend altogether upon the tentative assumption made upon ores not known to exist, but reasonably believed to exist, within moderately defined limits. The net value placed upon such ores, after considerable qualification, may be taken to represent the "possible value factor."

SAMPLING AND ESTIMATING THE ORE IN A MINE.—It would perhaps be impossible to lay down general rules suitable for any case, or to propose a method which could be universally and advantageously applied to the sampling and estimating of the ores of any mine. (But, wherever possible, the plane of vein should be shown in graphic drawing.)

Each mine presents problems peculiar to itself which must be solved by the engineer in charge of the examination. Questions are constantly arising which must be decided by that judgment which comes only from experience and knows no set rules or formulae.

NOTE.—B. B. Lawrence of New York City is entitled to credit for suggesting the use of the terms "positive ore," "probable ore," and "possible ore."

Is Siderite Magnetic?

TO THE EDITOR:—Under "Concentrates," in your issue of Feb. 14 last, you stated: "Siderite (carbonate of iron) occurs in the Payne mine, at Sndon, B. C., which is naturally magnetic, a very unusual property in this mineral," which may prove misleading to some of your readers, for, in the sense in which the word "magnetic" is always used in common speech, it can be safely said that this mineral is never "magnetic."

On the other hand, that siderite possesses sufficient magnetic attractability to permit of its being profitably removed from zincblende, galena, quartz and many other minerals by magnetic separators, giving magnetic fields of great intensity, was demonstrated some years since by John Price Wetherill, who secured patents in the United States, Canada, Germany and many other countries covering the process.

The information given under "Concentrates" is generally so accurate, it is surprising that in this instance the slightly magnetic properties of siderite should have been mentioned as unusual, since the magnetic removal of the unroasted mineral from blende, in accordance with Mr. Wetherill's discovery, has been practiced commercially for some years, and the Wetherill patent involving the right to do so has been upheld by the imperial courts in Germany, as against would-be infringers.

The magnetic separation of unroasted siderite is now carried on by the following companies in Germany: Gesellschaft des Emser-Blei- & Silberwerks, Ems, Germany; the Bensberg Gladbacher Bergwerks & Huetten-Actien-Gesellschaft "Berzelius" Gladbach, Germany; the Silber & Bleibergwerk "Friedrichsseggen," Friedrichsseggen a Lahn, Germany; and the Gewerkschaften Lohmannsfeld & Peterszche, Dusseldorf, Lohmannsfeld, Neunkirchen, Rbs. Arnsberg, Germany.

JOHN N. JUDSON.
New York, March 2.

A HYPODERMIC INJECTION of a 2% solution of hydrogen peroxide is considered the best antidote for cyanide poisoning.

Improvised Ventilating Machinery.

Written for the MINING AND SCIENTIFIC PRESS by
C. M. MYRICK.

How to get fresh air into the working face is an ever-recurring problem in mining work, and often it is a very serious one for the prospector, who must needs develop his claim with a minimum expense for machinery. Even in old-established mines the means are not always at hand for transmitting power to out-of-the-way points to operate ventilating machinery.

Not to mention the ways of inducing air currents by making double compartments in shafts and tunnels, it may be interesting to see how advantage can sometimes be taken of local conditions to solve the problem.

The direct application of heat to induce air currents can be employed in various ways, and the following is one case where the principle was put into practical use. It was desired to run a raise from the tunnel level through to the surface. The tinsmith of the town was called upon to make sufficient 2½-inch tin pipe to reach from the top of the raise to the tunnel mouth. The hunk house stove was requisitioned and set up at the tunnel, with the tin pipe leading into its damper. A few joints of stovepipe were put on and a fire started. At first it did not have much effect, but when the stove was hanked around with earth, so as to seal up all cracks, the had air and smoke were drawn out of the raise. Of course, it was necessary to keep the fire going in order to induce a circulation, but in a timber country that was not a serious matter.

Where even a low fall of water is available it is easy to construct some form of wind box with nothing but a few boards. At one mine where a small stream of water flowed down the gulch, past the tunnel, a water blast was got in operation in a few hours. (See Fig. 1.) Four 12-inch boards, 12 feet long, were

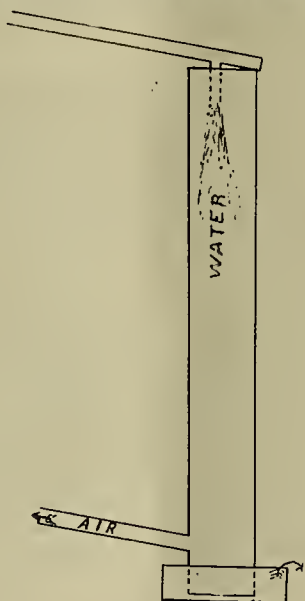


FIG. 1.

nailed together, making a box with open ends. This was stood upright in a small tank 8 inches deep and 16 inches square, in such a way that it came within 1 inch of the bottom. Just above the tank an air pipe leading underground was let into the upright box. A little ditch was then dug from the creek to a point over the tunnel, where it joined a small V trough that rested at its outer end on the upright box. When the water was turned on it dropped through the vertical box, filled and overflowed the small tank and thereby formed a seal that effectually prevented the escape of the air that was carried down by the falling column of water. There was no outlet for this compressed air, except by way of the air pipe that led into the tunnel.

In the case at hand some old 6 inch water pipe was used as an air conveyor, and the apparatus supplied sufficient air for twelve men at work-stopping and using powder. The stream supplied not over 1 inch of water, and at times much less. To get the best results we found it important that the water should drop freely in a fairly solid stream. The use of a screen to spread it over the whole area of the box was tried, but with poor results. Some claim that in water blasts built on this principle it is best to have a large air reservoir at the bottom of the upright box—a harrel being sometimes used for that purpose—but in the case described the results were very good without it.

If one would realize the power of falling water to produce air currents he should try to stand at the foot of one of the high waterfalls in the Yosemite, and feel the almost hurricane force of the wind that blows from the gorge at its foot.

At still another mine the same principle was utilized

under different conditions by putting in a water blast that cost nothing to operate and needed no attention. (See Fig. 2.) The mine was equipped with a Cor-

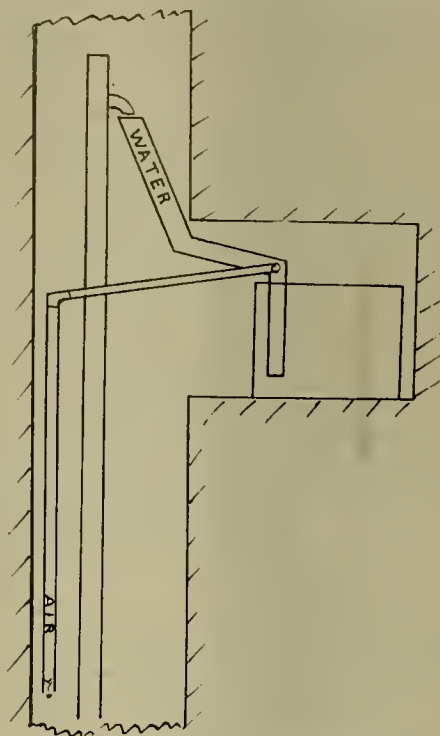


FIG. 2.

nish pumping system, and the water was raised from the sump by the regulation sinker having the rod passing down through the water column to the pump bucket. This discharged into a station tank 100 feet above the bottom level. It so happened that the last section of column pipe that had been put in reached some 6 feet above this tank and the water was conducted from the discharge into the tank by means of a wooden box. When it was desired to continue the bottom drift the question of ventilation came up and was solved by using this fall of water. It was not possible on account of obstructions to get a clear fall for the water, so a covered box was put in, partly on a slope and partly horizontal, and the lower end carried nearly to the bottom of the tank. Even under these conditions the large volume of water was able to create a suction of air, and the water in the tank kept the lower end of the box sealed against its escape. An air pipe was then let into the side of the box at the top of the tank. This pipe was carried down the shaft 100 feet and then through 300 feet of drift to the working face, where it delivered the necessary air.

When the supply of pipe was used up the line was continued with wooden boxes 5 inches square inside, made with the ends beveled to form a slip joint, and luted with clay. In a wet mine such boxes give little trouble by leaking air, and for temporary use, as in this case, it is economy to use them even when lumber is comparatively dear.

At a Mexican mine it was desired to ventilate a winze being sunk from the 500 level at some distance from the shaft. An old Sturtevant 4-inch blower was on hand, but nothing could be found to supply the power, and it meant a delay of two months to send for a small engine. At the 400 level was the main station for the Cornish pump. Enough 1½-inch water pipe was found to reach from that point to the winze. The column was tapped above the pump, so as to take advantage of the water pressure from there to the next station, 200 feet up, and connection made with the 1½-inch pipe. This gave a pressure of 300 feet at the bottom. Our water wheel was 18 inches in diameter and entirely home made. The body of it was of two thicknesses of 1-inch boards, with saw cuts around the circumference, into which sheet iron buckets were driven and secured by two nails. The blacksmith had quickly shaped them out of thin sheet iron into a form somewhat similar to those used on the Knight wheel. The nozzle was also made by the blacksmith from a piece of the water pipe and had an opening of about ½ inch. The wheel was mounted on a shaft with pulleys calculated to run the fan at 1200 or 1400 revolutions when the water wheel was going at the proper speed for the size and water pressure.

When belted up and water turned on it sent abundant air through a wooden box down the winze, which was continued to a depth of nearly 300 feet. The small amount of water was not noticeable in the working of the pump.

A steam hoist was set up to draw from the winze, but the power for the air blower continued to be supplied by the water as being more economical than using steam at that distance from the boilers, and, besides, the native miners could be trusted to handle a water valve when they needed air.

Crude Oil as a Fuel.*

By A. M. HUNT, San Francisco, Cal.

The question is frequently raised as to what oil is best adapted for fuel purposes and gives the greatest value per dollar expended. Within the range of fuel oils on the market to-day there is very little choice. Most of the oil sold for fuel purposes ranges in gravity from 14° Baume to 20° Baume, and the persons producing light and heavy oil each present arguments in favor of their product, attempting to prove that it has higher heat values.

In considering this question it must be borne in mind that oil is always purchased by measure and not by weight. It is true that the lighter gravity oils contain a slightly greater number of heat units per pound than the heavier oils; but in buying a gallon of heavy oil a person obtains more pounds of fuel than in the case of light oils. In the operation of the Independent Electric Light & Power Co.'s plant, at San Francisco, Cal., very careful records have been kept of the amount of oil consumed and of power produced for a period of over two years. During the first year the oil used was of heavy grade, averaging about 14½° Baume. During the second year the oil used varied from about 18° to 20° Baume. Taking the total records of the two years, if there is any difference whatever in the results obtained, I should say it was slightly in favor of the heavier oil, although the difference is so slight that it might be accounted for by factors other than the oil. The heavier an oil is the more difficult it is to force it through small pipes and connections of a plant. By properly arranging the devices, however, this point offers no difficulty, and if I were contracting to-day for fuel oil, I would not pay a fraction of a cent difference per barrel for one gravity of oil over another, within the limits of the oil that is handled in the market.

The principal application of oil for fuel is the production of steam for various uses, and the measure of value of the oil is usually taken as the number of pounds of water which the oil will evaporate, and in order that different instances may be brought to a common basis for comparison, the actual evaporation is always figured at what the evaporation would be from water at 212° F. I have made a great many tests at different times during the past eight years on this point, using boilers of different makes. The best result I have ever been able to obtain under the most favorable conditions, and with efficient types of boilers, has been an evaporation of 15½ pounds of water per pound of oil from and at 212° F., and this only when the load on the boiler was maintained uniformly during the test at the best point of economy for the boiler. I have frequently seen claims made of higher evaporation than this, but have always been inclined to discredit them. Not many years ago there was a man in San Francisco who claimed by the use of his particular type of burner to produce an evaporation that would require the oil to develop heat units in excess of what the oil actually contained; in other words, to produce something out of nothing.

In installing an oil-burning plant, the question of what type of burner to use is one that causes a great deal of worry to the average man. The number of burners on the market is enormous, each claiming to be better than any other and to produce results that exceed those obtainable by any other type. During the present year there has been undertaken by the Navy Department a series of tests as to the adaptability of oil for fuel purposes on our men-of-war vessels, and there has been lately issued in the annual report of Admiral Melville, chief of the Bureau of Steam Engineering, a preliminary statement by the board having this matter in charge. The work which has been undertaken will certainly prove of great value to all users of petroleum fuel, and the undoubted impartiality and honesty of this board gives greater weight to their statements than the usual run of reports and tests of similar character. I quote several selections which indicate the opinion of the members of this board on the question of burners, and can state that my own experience confirms them:

"That the efficiency of oil fuel plants will be greatly dependent upon the general character of the installation of auxiliaries and fittings, and, therefore, the work should be only intrusted to those who have given careful study to the matter, and who have had extended experience in burning the crude product. The form of the burner will play a very small part in increasing the use of crude petroleum. The method and character of the installation will count for much; but where burners are simple in design and are constructed in accordance with scientific principles there will be very little difference in their efficiency. Consumers should principally look out that they do not purchase appliances that have been untried and are designed by persons who have had but limited experience in operating oil devices."

"There are on file in this bureau over 2000 drawings and specifications pertaining to the use of liquid fuel, and it is said that new patents are being issued at the rate of about thirty a week."

"There has been sufficient evidence already pro-

duced to prove that in all probability special forms of burner will be required for different types of boilers."

A further point that is frequently raised in considering the use of petroleum is as to its relative value, compared with coal, and in connection with mining installations the comparison must often be made with wood. It should be borne in mind, in making any such comparison, that the words coal or wood do not express any standard, as there is extremely great variation between different coals and different kinds of wood. Crude petroleum, so far at least as produced on this coast, is fairly uniform in heat producing power. Taking the result of my experience with coast coals, and assuming Wellington coal as a standard, I should give their relative values as being about 4 to 4½ barrels of crude oil equal to about one long ton of average Wellington coal. Taking the average wood used for fuel in California, I should place approximately two cords of wood equal to one ton of coal. I have frequently heard oil men give the relative value of oil and coal as 3½ barrels of oil per ton of coal, but consider that this figure is apt to lead to disappointment when actual tests are made.

I have been asked to make a hurried comparison as to the cost of power developed on tide water of San Francisco, in large units, using fuel oil, with the cost of delivery of electric power over a long-distance line, assuming the power to be produced from some one of our many mountain streams. In making this comparison, I was asked to take plants capable of delivering 50,000 H. P. each, and assuming the distance of transmission to be 200 miles.

The data which I have used for the steam plant is as follows:

That the plant shall contain eight 5000 kilowatt steam turbine-driven alternators, and to be fitted with the best type of boilers, auxiliaries and all devices for economy. I have taken the price of fuel at 55 cents per barrel, at which rate long-term contracts have been made for large quantities of oil within the past few months. I have assumed that the hydraulic plant will have an equal number of units driven by impulse wheels; that the distance of transmission, as before stated, will be 200 miles, and the voltage for transmission 60,000.

In order to eliminate as many items from the comparisons as possible, I have made a close estimate of the cost of the steam plant, the data of which can be absolutely determined, and I would state that this estimate is based on present prices of machinery, and confirmed by the results obtained in the erection of large plants within the past few years. In the case of the hydraulic plant, these elements are not absolutely determinable, as each individual case is a law unto itself.

The cost per horse power installed in the steam plant is, however, such that I can positively state that to equal it in any hydraulic plant, taking into account the hydraulic development, power-house machinery and everything up to the point where the power goes onto the line, would require that the conditions should be extremely favorable, and I doubt whether there is any locality in California—at least, none with which I am acquainted—that would permit an equally low cost. The amount of labor in the steam plant, using such units as have been indicated, and with the small amount of labor required in operating a boiler plant using oil, would be no greater than the labor required to operate the hydraulic plant and care for the water system. The items of cost which should be compared and which I have assumed and taken, are the interest, depreciation and taxes on the cost of the pole line and the cost of patrolling and caring for same; in the steam plant, the cost of fuel, water required for steam, and miscellaneous supplies. The amount of fuel required to produce the power I have taken from the actual results and experiences in plants which I have operated, and while the conditions are such that it is not possible to lay before you in detail the record of operation of these plants, I can assure you that the figures are absolute and correct. It is probable that any figures which I may lay before you will be criticised and attacked, but I have endeavored to give them without bias or prejudice, in order that the comparison may be absolutely fair.

The amount of copper required to transmit 50,000 H. P. a distance of 200 miles, at 10% loss under normal conditions, is approximately 16,000,000 pounds. It would be absolutely necessary to erect at least two distinct and separate transmission lines, in order to guarantee continuous operation. I have figured on using a form of tower construction that would make stability the first item of consideration, and would give as my estimate of the cost of such lines \$3,500,000, which would cover cost of material and erection, rights of way, etc.

I will take, first, the cost per horse power, when same is called for and taken twenty-four hours daily for 365 days per year. In the case of the water power plant, it is immaterial what the number of hours may be. The cost of operation per horse power of plant installed remains the same, as the operating cost is a lump sum which does not vary with the number of hours' use made of the current. I have assumed, for the purposes of calculation, that interest, depreciation, taxes and all other charges against the pole lines will be covered by 12% on the investment therein and I do not think that this is in any way excessive. The total charge, therefore, against the pole line

would be \$420,000 yearly, or the sum of \$8.40 per horse power per year.

Under similar circumstances, operating the steam plant twenty-four hours daily and 365 days per year, the output of the steam plant per horse power installed would be \$19.68, showing a very great advantage for the water power. However, there is no instance in which power is taken twenty-four hours daily for the entire year. It must be remembered that these figures do not represent the actual cost of producing power, but are only the cost of the items not common to the two cases compared.

I have made a second comparison, taking the actual operating conditions as they obtain in the city of San Francisco, in a plant carrying both power and lighting load, as well as a portion of the street railway system. The load of this plant is absolutely representative of the local conditions, and any person figuring on entering San Francisco market with transmitted power must figure on the conditions as they actually exist. It should be borne in mind that during the winter time the amount of load taken by practically all consumers is very considerably increased, and that they will all make heavy demands for a very limited time in the evening during such months. As an example, all factories operating and taking current from an electric power company need lights for a comparatively short time, at period between half-past four in the afternoon and the time of closing, and to meet this demand machinery must be installed which will be entirely idle during a great part of the year and only operated for a short time daily during the balance of the year.

It will be very surprising to any of you to know the actual facts with reference to the street railroad load in the city of San Francisco. I believe I am well within bounds, basing what I say on information received from parties well informed on the matter, that the maximum load during the twenty-four hours on the street railway system is at least three times the average, figured on a 24 hour basis. Taking the cost for delivery of power, under conditions as they actually exist with the hydraulic plant, the cost would be \$8.40 per horse power per year. With the steam plant this figure becomes \$5.72, showing that with the conditions as they exist at the present time, the character and class of load being taken from actual results, the price of fuel being taken on the basis of contracts lately made, the steam plant has the advantage.

In this connection it should furthermore be borne in mind that there is little or no probability of the cost of transmitted power being reduced. The only way in which the charges under consideration in the present instance could be lowered would be by increasing the voltage at which the line is operated. It seems to be the general consensus of opinion, and as the results of experiments made, that the voltage of 60,000 is as high as we may expect to see used unless some radical unforeseen developments take place. The converse is the case with reference to power generation from fuel. The entire engineering world is at the present time in a state of ferment over the solution of this problem. Internal combustion engines are being developed more and more, and types in which oil may be used direct in the cylinders of the engine are coming to the front and promise practical results. The Diesel motor has lately been taken hold of by a large company in New York and will be vigorously exploited in this country. Reliable tests show that it will yield a horse power with two-thirds, if not less, of the amount of fuel used by the best steam engine. A new type of oil engine, of 200 H. P., is under construction in this city at the present time that promises to give a horse power on less than one-half of the fuel oil used with the best steam engine. And it seems more than probable that within a very few years present results will be greatly improved.

With the amount of fuel oil which is being produced on the Pacific coast and the conditions which exist with reference to other fuels, it has always seemed to me that it should be adapted to a greater variety of uses. A considerable amount of work is being done at the present time in the utilization of crude oil to the exclusion of coal in the production of gas, and this promises to become a quite important factor in the crude oil market. There is no reason why crude oil should not be applied to forge work and heating furnaces, and this is done in some of the Eastern manufacturing, not only on the score of less cost, but greater convenience. I see no reason why the high-priced coke used by foundries should not be replaced by crude oil. It would involve the necessity of modified forms of cupolas and, possibly, the adoption of some type of hearth furnace, but the incentive would seem to me sufficient to justify experiment in this direction. If iron is ever to be smelted on this coast, it would seem to me that it must be done with oil fuel, or at least with its aid. It is believed by leading metallurgists that the presence of solid carbon is necessary to the reduction of iron ore; but even this factor does not necessarily preclude the use of crude oil, as it contains on the average approximately 84% of carbon, and it is by no means an impossibility that the problem may be successfully solved.

STONE ARCHES are sometimes employed in mine work to support ground, but they are not in common use. This sort of structure is often advisable at the entrance to tunnels and inclined shafts.

*Trans. California Miners' Association (condensed).

Milling at the Camp Bird, Colo.*

By THOMAS H. WOODS and GODFREY D. DOVETON.

The output of the Camp Bird mine, Ouray county, Colo., may be considered ideal milling ore, yielding its values readily to amalgamation, vanner concentration, and subsequent cyanide treatment of the tailings. The method of treatment, while it offers few new features, is of interest as an example of the reduction of a docile ore. The following is a synopsis of the method employed: Breaking with crushers, pulverizing with stamps, copper plate amalgamation, vanner concentration and direct treatment of the tailings by cyanide.

THE BREAKING OF THE ORE—The loaded tram buckets, after leaving the tramway terminals, are trammed on suspended tracks to the crusher house and dumped on grizzlies. Each ore bin, of which there are three, is equipped with a grizzly at each end, the fines passing through to the main bins, while the coarse falls to the crusher jaws, and thence to the ore bins. The grizzlies, 12 feet long, set at an angle of 45°, pass all material under 2 inches. The rock breakers, 9x15 inches, set at 2 inches, are placed directly over the center of the ore bin. This arrangement insures a comparatively good mixture of the fine and coarse rock.

ORE BINS—Each of the bins has a capacity of 180 tons. The floors are set at an angle of 45° and lined with ½-inch boiler iron. The chutes, from the bins to the automatic feeders, are controlled by a rack-and-pinion gate. In addition to these ore bins there is a large reserve storage containing sufficient ore to run the mill for six days.

THE STAMP BATTERY—Foundations: Trenches 10 feet in depth are blasted out of the solid rock, and mudsills placed in the bottom are securely wedged against the sides of the pit and packed with concrete. Upon these the mortar blocks, of 2 inch plank set on end, are spiked and bolted together. Two sets of binders, front and back, are bolted to the mortar block, but not to the battery timbers. The writers are of opinion that less jar is transmitted to the battery timbers when they are not bolted to the mortar blocks, so that they do not get the jar due to the impact of the stamps.

The mortar rests upon a rubber gasket ¼ inch thick and is bolted to the mortar block with four anchor bolts, front and back. The battery frame timbers are made of the best grade of dressed Oregon fir. The king posts are bolted to the street sills with 1½-inch bolts of Norway iron. All bolts in the framing are of Norway iron, since cast iron is of little use when subjected to such vibration. The king post is also bolted to the ore bin above and below the cam shaft floor. The mortars are of the Homestake pattern, but amalgamation is not conducted inside. It has been found advantageous here to use the battery as a pulverizing machine only, for a very perfect amalgamation is secured on the apron plates.

The cam shafts are of hammered steel, 6 inches in diameter and 14 feet long, fitted with Blanton cams. Both steel and cast iron cams are used, but steel cams have given the most satisfaction.

Babbitted journal boxes are still in use, although two cam shafts are running in hearings without babbitt. In the writers' experience, however, babbitted boxes are to be recommended, for the following reasons:

1. The alignment of the shaft can be more easily kept true with a babbitted bearing, because, no matter how carefully the battery foundations are erected, a small amount of settling is sure to take place. This increases the difficulty of shimming up a cam shaft bearing or a battery post.

2. In replacing a broken shaft with a new one, more perfect bearings can be obtained. Bearings without babbitt have a tendency to wear to a greater or less extent.

During the last four years, with an average of forty-five stamps per shaft, four cam shafts have been broken. This remarkably clean record is due in great part to the excellency of the battery foundations. Extra cam shafts are, however, always kept on hand ready for use.

THE STAMPS—The stamps weigh 850 pounds each and drop 100 times per minute. The speed has recently been changed from 90, with the result that the capacity has been greatly increased, a better splash obtained, and a consequent reduction in slimes observed. The order of drop is 1, 4, 2, 5, 3. The drop is set at 6 inches, and, as the shoes and dies wear, reset at 8.

The even distribution of the weight in stamps is a matter frequently overlooked by machinery manufacturers, too much weight being often apportioned to the stem and boss, with a tappet too light for the work it has to do.

The stems are made of soft steel, 14 feet in length, 3½ inches in diameter, and weigh 380 pounds. When broken at both ends they are sent to the machine shop, thoroughly annealed, turned in a lathe, and again put into service. The tappets weigh 80 pounds and are both of cast iron and steel. The latter is

much preferred—they rarely break, have a much longer life, and seldom require facing.

The automatic feeders are mostly of the Challenge type, but four are of the suspended type. The feed tappets are attached to the middle stamp stem. Solid feed collars have been in use until recently, but are now replaced by a sectional feed collar. A great deal of time is saved in replacing a broken feed stem by their adoption, as no chipping of the broken stem is required. The hoeses are of cast iron, weigh 250 pounds, and are attached to the stem in the usual manner. The plugs are removed with careful charges of giant powder.

The shoes weigh 140 pounds when new, and are attached to the hoeses with hardwood shims. Soft wood has been found useless for this purpose. Three kinds of shoes are in use in the mill at present and a comparative table showing the cost, life and wear of iron per ton of ore crushed may be of interest:

	Chrome Steel.	Forged Steel.	Cast Iron.
Cost per lb. at mill, cents.....	8	6½	3½
Weight when new, pounds.....	140	137	135
Weight when discarded, pounds...	35	40	40
Actual life, days.....	106	72	41
Wear per ton ore crushed, pound..	.318	.43	.71

The cost of iron per ton of ore milled was, in the case of the chrome steel, 25 cents; with the forged steel, 2.75 cents, and with the cast iron shoes, 2.4 cents.

As the result of the above experiments, and taking everything into consideration, the chrome shoe was ultimately decided upon as the most economical at the present time. Forged steel, chrome steel and cast iron dies have been in use.

The chrome steel dies were of the sectional type, which possess some advantages in being readily removed from, and replaced in, the mortar. They also give a more constant depth of discharge. On account of the short life of the die top, however, and the annoyance caused by chips of steel from the mine getting between the top and the base, they were discarded for a solid forged steel die. The relative wear of the different dies is shown in the following table:

	Chrome Steel.	Forged Steel.	Cast Iron.
Cost per pound at mill, cents.....	8	6½	3½
Weight when new (tops), pounds..	76	143	140
Weight when discarded, pounds...	22	50	50
Actual life (tops), days.....	41	80	42
Wear per ton ore crushed, pound..	.42	.36	.75
Cost per ton ore crushed, cents....	3.36	2.30	2.4

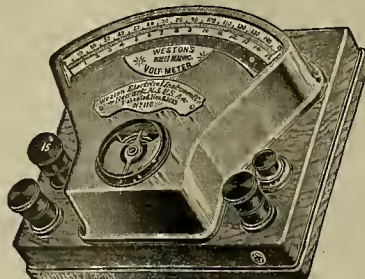
Chuck blocks 4 inches, 3 inches and 1½ inch are employed to keep the depth of discharge as constant as possible. The height of discharge is normally 5 inches, and at this the slining is reduced to a minimum and the maximum crushing capacity attained. Forty-mesh slot screens have been in use until recently, but have been replaced by 25-mesh, No. 29 wire cloth. The wire screen is infinitely superior and cheaper, having a greater discharge area, and the constant annoyance experienced by chips when the slot screen was in use is entirely abolished. The batteries can also be fed much lower than formerly, with desirable results.

The cost of a slot screen at the mill is \$1 49, and that of a wire cloth screen \$0.85. The former has a life of three days, or 46½ tons of ore, the latter a life of six days, which corresponds to the crushing of 93 tons of ore. Thus the slot screen costs 3.2 cents per tons of ore crushed, while the wire cloth screen costs but .9 cent.

(TO BE CONTINUED.)

The Weston Electrical Measuring Instruments.

The portable direct reading electrical measuring instruments made by the Weston Electrical Instru-



Weston's Direct-Reading Voltmeter.

ment Co., Waverly Park, Newark, N. J., are high grade and popular.

In the distribution of electrical energy in mining, for lighting or power purposes, it is essential for economical and satisfactory service to maintain a constant relation between the supply and demand.

Variations from the normal ratio of supply and demand means money lost.

To be of any real value an indicating instrument must be theoretically correct in principle, accurate throughout its entire range, simple in construction and economical in operation. The principle embodied in the Weston instruments consists in the simple movement of a small coil through a uniform magnetic

field against the opposing force of a very light spring. By avoiding the use of all moving iron parts, magnetic lag is eliminated. The principle of its construction involves a uniform magnetic field, forcing the coil to which the pointer is attached to take up a position corresponding exactly to the amount of current passing through it. In construction these ammeters and voltmeters have but a single moving part, consisting of a little coil weighing a small fraction of an ounce, and to which the pointer traversing the scale is directly attached.

The Weston standard voltmeter, with its wide range, simplicity and accuracy, is deemed a valuable adjunct to mining plants, as by its use one can tell in a glance the voltage of the current employed and thus regulate the supply to the demand.

Having what are claimed to be the largest and best equipped works in the world for the production of electrical measuring instruments of all kinds, the Weston Electrical Instrument Co. states its ability to turn out work of any special character in which excellence of mechanical and electrical work and design are important features.

The company has recently opened an office in New York City, and are represented on the Pacific coast by Frank E. Smith & Co., 418 Eugenia avenue, San Francisco, who extend a cordial invitation to all interested in the subject of electrical measurements to call upon them either for the purpose of inquiry, on the technical points involved, or for the prospective purchasing of instruments.

Smooth-On Iron Cement.

Many breakdowns are incidental to machinery subjected to steam and hydraulic pressure and can be successfully repaired by the use of the material known to engineers as Smooth-On Iron Cement. The uses of this material in repairs are numerous, and one of these is shown in the engraving, which is of



Pump Repaired With Smooth-On at U. S. Navy Yard, New York City.

the repairs to a large centrifugal pump in a drydock pumping station, New York Navy Yard.

The following is an extract from a report made by an engineer in the department of construction and repairs:

"For over four years I have used your Smooth-On Iron Cement No. 1 and have found it to be as good as a new casting when used in repairing breaks in castings. I have found it to make steam joints tight when everything else failed. I have used it on porous castings that had to stand 180 pounds steam pressure. I have used it on steam pipes that leaked, and will say that I have never had any trouble with anything I have repaired with same.

"About four years ago one of our 45-inch centrifugal pumps split almost in two, due to a sudden strain. The crack was over 20 feet long and in some places opened up ¼ inch. To replace this pump would take months, and we needed it badly. This fracture was repaired with Smooth-On Iron Cement No. 1 and the pump running on the third day after the break, and ran successfully for thirteen months, when it was replaced by a new pump. The repaired pump was, however, giving as good service as when first repaired. This pump (above cut) broke about one and one-half years ago, and was repaired with Smooth-On, as was the first pump, and it never has given us any trouble since. The cut shows the pump as now in use. The fracture extends from A through B to C and from C to D. Patches 1, 2 and 3 are brass; straps 4, 5, 6 and 7 are of wrought iron. Smooth-On was used in fractures and under patches and straps.

"When the new pump was placed the flanges connecting the gate valve with the pump did not come in line by 2½ inches. To make this joint the pump

*Trans. Am. Inst. Min. Engrs. (condensed).

flange was cut off, a plate of wrought iron was flanged and shaped to fit the interior of the main and bolted to it, so the flange fitted the flange of the gate valve. Both the flange joint and the joint between the main pipe and the inserted flanged sleeve were made with Smooth-On.

"The suction pipe to this pump broke in two, underground—due to settling of the ground—over three years ago. This was also repaired with Smooth-On and has never given trouble since. I have had at least a dozen more of these breaks, and after repairing them with Smooth-On have never had any trouble with them."

Smooth-On Iron Cement No. 1 is a metal cement, which, when properly mixed with water, metallizes and slightly expands during the process, which action makes it invaluable for many mechanical uses.

This iron cement is made by the Smooth-On Manufacturing Co., Jersey City, N. J., U. S. A., who will send their illustrated book free.

This substance is for sale in San Francisco, Cal., by the Western Repair & Supply Co. of 61 Steuart street, who will furnish any desired detailed information.

Late Improvements in Copper Smelting.*

By HERBERT LANG, M. E.

The last twelve years, comprising the final decade of the nineteenth century and the beginning of this, have seen very great improvements in the metallurgic arts, particularly in those which are susceptible of being placed upon a scientific basis. The application of chemical principles and the study of design have together assisted in the most remarkable advance that the method of ore treatment has ever shown, an advance that has been, for reasons that will suggest themselves, more marked perhaps in the domain of smelting than in any other industrial pursuit in which mankind has been engaged. The directions in which this advance has been made and the forces that have conspired to make it are the subjects of this writing.

Copper smelting is far from being a new art. What we know of it is made up of a mixture of facts and theories, parts of them the outgrowth of the study of science, part the heritage of ages during which the art of getting copper from ore has been practiced. Strictly speaking, there was no science of smelting until within a few years past, and it may be disputed by some whether even now we have a really scientific conception of smelting sufficient to cover it in its numerous phases. On that subject there is not much to say, but on the purely practical side, there is no more fertile subject than copper smelting, and it is upon this phase that I desire to chiefly touch.

The most marked tendency of late years has been toward the increase of capacity of smelting plants. This has been accomplished in a variety of ways. The most obvious method of increasing the daily capacity of a furnace is to enlarge that furnace; and this has been done in most cases, until in place of the little stacks of a dozen years ago, smelting perhaps ten, twenty or thirty tons daily, we now see leviathan furnaces handling 100, 200 or 300 tons, and even these capacities are not regarded as so wonderful since much larger furnaces have been projected and even built. What the iron furnacemen of ten years ago would have regarded as a very pretty day's work, namely, the reduction of 200 to 500 tons of ore, in a furnace 60, 70 or 80 feet high, the copper smelter is now accustomed to put through a furnace of 20 feet high, with equal ease. Much of the success achieved in this line is due to the improved methods of handling which copper smelters have borrowed from the iron men, whose experience in the manipulation of enormous quantities of material has been of invaluable assistance to the world. To their mechanical devices for such purposes we are much indebted. In still other ways are we indebted to iron smelters, particularly for the principle, or rather the mechanism, of the Bessemer converter, which has been adapted to the purposes of copper production with the greatest success. It has likewise been attempted to introduce the open-hearth furnace, in the form known as the tilting hearth, as used by steel makers, but it is questionable if its use will ever get beyond the works at Great Falls, Mont., where it was first inaugurated.

In many other respects, copper smelters have struck out for themselves, and have made such changes and improvements in their craft that to the practitioner of a dozen years ago it would hardly be recognizable. The greatest and most distinctive of these changes are due to the pyritic process, which has come to take rank as the most scientific of all the branches of metallurgy that have relation to precious metal mining. By its aid, the domain of copper smelting has been extended to varieties of ore which were formerly not supposed possible of profitable reduction by any process whatever, being given up by the metallurgists of that era as too refractory for any mode of treatment. Without this process there would be no means of handling, for instance, the heavy masses of sulphides of iron that compose so

great a part of the mineral resources of all gold and silver mining regions. Although the pyritic process was introduced originally for the purpose of treating sulphides of this sort, its usefulness in treating other varieties of ore has been demonstrated thoroughly, and the utility of other smelting methods has been greatly enhanced by the natural reaction of one process upon another, but particularly by the application to other processes of the principles and deductions which the intense study of the pyritic agencies has brought forth. It is not likely that any other metallurgical process or family of processes has ever received as close and persistent an examination at the hands of science as has the pyritic method. For, coming on at a time when the curiosity of the metallurgical world was aroused by the high promise of the process and the study of chemical metallurgy had begun, there were many acute observers who took advantage of the occasion, and by whose united labors, added to those of the inventive class of practitioners, the process was subjected to thorough examination and extensive practical improvement.

Among the difficult classes of ores whose qualities have been overcome by this new aid to smelting, are the arsenical and antimonial substances which from time immemorial have given annoyance to the miner, interfering so disastrously with the extraction of silver, lowering the quality of copper, and lessening the saving of gold in those ores which contained the deleterious matters. Arsenic especially was the great bugbear; and even now the custom smelters, remembering the old and not unreasonable

although the proportion of paying ore to the amount smelted is not usually more than one-half. The practice, which has been evolved by the genius of Dr. Carpenter, who combines great experience with high professional skill, results in the production of a matte, one ton of which contains all the values of at times forty tons of ore. The same thing with some modifications is being done at one or two points in Colorado, the smelting process in use at Deadwood having been transported to a favorite field of metallurgy, the Gilpin county gold region, the home and birthplace of the distinctive style of stamp milling, known as the Colorado method of high and slow drop. There is every indication that even here the smelting processes are bound to displace the rival but less perfect method. It has been suggested to smelt direct the hulk of the copper ores of Butte, Mont., which by the existing practice are first concentrated and then smelted. In order to understand fully the nature of the proposal, let us examine briefly the condition of things and the processes now made use of at that great camp. In the first place, the ore, to the enormous daily extent of 6000 or more tons, is concentrated by water, whereby its copper percentage is raised from four or five to from fifteen to eighteen. The concentrated material is now roasted in mechanical furnaces down to an average content of 5% or 6% of sulphur, and then, while still hot, is fed into reverberatory smelting furnaces of the largest size ever made. At times there have been a hundred or more of these large brick furnaces running on Butte ores or concentrates, producing a 50% matte for



BIRD'S-EYE VIEW OF

prejudice, charge the miner a penalty if his ore contains an appreciable proportion of it. Ores containing arsenic as an essential ingredient, in the form of mispickel, have been treated by the pyritic process with a complete and entire volatilization of this hurtful element, which then becomes the easiest of all substances, which we find in ores to get rid of, hardly excepting the moisture which may be combined with them. It often happens that water itself is so strongly combined with the other constituents of ore that it is expelled therefrom with some expense of fuel, but arsenic in the pyritic furnace is dissipated and driven away at a still lower temperature.

Tellurides of gold and silver, that give troubles in amalgamation and concentration, give none in modern smelting; and the sulphate of baryta, that interferes with the lead and ordinary copper smelting methods, is disposed of in pyritic work with ease. The latter substance forms the main part of the charge at the new Crofton, British Columbia, smelter, and might be supposed to be objectionable under the circumstances there, but contrary to the usual case, it is easily eliminated under skillful management, forming a very good object lesson in the adaptation of a process to uncommon conditions.

We should not overlook the extension of the smelting processes to what was once regarded as the exclusive field of milling and concentration. An instance of this is the treatment at Deadwood, South Dakota, of great quantities of comparatively low-grade siliceous gold ore, carrying hardly ever more than \$10, and frequently but \$5 per ton. This is fluxed exclusively with limestone and melted with coke, brought from a great distance, but so cheaply is the work carried on that it yields a good profit,

the converters. These items are worth our consideration, for they imply the greatest improvements that have ever been made in the reverberatory form of smelting. The furnaces are heated with coal, and the largest burn twenty or more tons in a day, beyond which it was supposed to be practically impossible to go, on account of the difficulty of supplying so exacting a monster with fuel. Some of the furnaces have produced and are fired with gas, which is in some ways an improvement over direct firing, yet the practical verdict at Butte, which is a very practical place indeed, is to the effect that the complications necessary for the purpose outweigh the undoubted advantages.

Having got a suitable matte, containing about 75% of the copper of the original ore, the rest being lost in previous steps, especially in concentrating, the next step is to bessemerize it, getting blister copper, usually referred to as bars, simply. Now it is proposed to substitute for this ingenious and very practical process, which has grown up in that precise spot and attained a development in ten years greater than Swansea achieved in 300, by a single operation, which shall lose but half as much copper and cost no more for carrying it out. Direct smelting of the ore as it comes from the mine will obviate even the crushing, as it is one of the virtues inherent in modern smelting in big furnaces that it will take in pieces of any size, just as they come out of the mine. The great question is that of flux, as it is in most other—we may almost say, all places. Having this, and having, which is a difficult thing to get, the money to engage in this pursuit, the next thing would be to build a works wherein half a dozen, or at most twelve, furnaces should do the work that the hundred rever

*Trans. California Miners' Association.

heratory, half a dozen blast, 300 or 400 roasting furnaces now do. It can be done, there is no doubt of it. But the question is, will they consent? Will the proprietors of works which have made more money in the last three years than anybody ever before made in the smelting business, allow the experience and the improvements which have built them up, while giving Butte its name as the greatest mining camp, submit to tear down what they may reasonably call the foundations of their fortunes? I think not, at least not until hard times come and economies are necessary. Men who have grown up with the industry—beginning at the time, for example, when I myself first saw Butte—when the smelting reverberatory which now averages fifty tons or more daily, sometimes reaching 100, and even 140, then put through ten or so, and some much less, they will be very loth to leave so many grand traditions behind and seek out new paths.

THE COST OF SMELTING.—The final criterion of any process is its cost per ton of ore treated. All other considerations are lost sight of in the universal cry for cheaper, and therefore more profitable, treatment. Time has been, and that not beyond the memory of most of us, when it cost the miner on the coast \$100 a ton to get his ore smelted, and there was no great profit in the smelting business even at that figure, if we can believe the word of those who were engaged in it at the time. Things have changed somewhat, and while many get their product treated for \$4, \$5 or \$10 per ton, a good many get it smelted for nothing, because the smelter wants it for flux. This is

amples are very near the lowest low-water mark of cost, and will undoubtedly remain so for some time. They can only be surpassed by plants combining the favorable features of large operations with cheap fuel and steady labor, good fluxes and first-class management. With these advantages, the reverberatory furnace has made rather good records. At Butte, two years ago, it was shown in court that the cost per ton of smelting the roasted and still hot calcines was but a trifle over \$2, and that, with coal screenings, to be had in Butte for \$1 per ton, the cost was reduced considerably below that figure. We must not forget that it is in application of the reverberatory to fine grained material, like the roasted calcines, that that furnace has achieved its greatest triumphs. To supply the stuff hot is also a great and striking advantage, comparable to nothing whatever in blast furnace smelting. This practice, curiously enough, is of English origin, being one of the few instances of British metallurgy that still survives in America. As I before mentioned, the strength of modern metallurgy lies in its groundwork of science, and nowhere is this better exemplified than in the present practice with the reverberatory furnace, which is now run with as much care and attention to scientific principles as the blast furnace, and usually with an imitation, more or less close of its methods of slag-building.

Excellent as has been the work of the past decade, we may reasonably look for better performances in the future. The smelting of to-day is a vastly different thing from the smelting of a half a generation

receiving \$50,000 cash—all of the balance was paid from the royalties from the leases. On Jan. 1, 1902, the purchasers took possession and the new regime with its systematic development began.

The immediate country is covered with an eruptive rock, the older formation showing in but a few places, on one of which Butler located these properties. At first it seems to have been the impression that the entire mineralized area was confined to these claims. Nevertheless, all of the surrounding territory was located and companies were formed to explore the outside territory. The Tonopah Mining Co. has not merely one ledge, and one mine, but a system of veins and ledges. The Tonopah Fraction Co., the Salt Lake Co., the Montana Tonopah Co., the Mizpah Extension Co., the Tonopah Belmont Co., all report having found ore. Many more companies are sinking in all directions, and farther and farther away, and gradually the working area is extending. These companies are, as a rule, well financed. The great problem at present is the treatment of the ore. The cost of shipping to smelters and treatment charges is greater than the estimated cost of treating it on the ground will be—but this latter requires that water and electric power be brought in at an expenditure of a large amount of capital. There was a time when this looked serious, because of the great amount of money necessary to be spent to bring in the power and sufficient water for milling, but as more ore was opened up the difficulty grew less, until now it is but a question of how soon. The Tonopah Co. has proceeded carefully with what has seemed to some a too slow and careful policy, shipping only enough to meet expenses while developing. The town, like all mining camp towns, not only has kept pace with the development of the mines, but is a little ahead of them—it is now a town of about 4000 people, with plenty of good water for domestic purposes, an electric light plant, water works, two newspapers, a stock exchange, good hotels, stable, banks, and with healthy and salubrious climate.

Two railroads are being surveyed, and two companies are in the field with promises of water for all purposes and electric power lines. The neighboring camps are Ray, 12 miles, with a mine shipping; Gold Mountain, 6 miles out, with at least one property with shipping ore; and Hanapah, Lone Mountain, and several others, all having more or less showing. But it would seem that Ray, Gold Mountain and Lone Mountain are of the most importance.

Assaying Cyanide Solutions.

Written for the MINING AND SCIENTIFIC PRESS by
R. STUART BROWNE.

Of the many ways of assaying cyanide solutions by precipitation, that by means of acid, copper sulphate and a soluble sulphide is the most valuable. This method is due to Prof. S. B. Christy, who first suggested it in 1893. So far as I have been able to ascertain, no investigations have been published regarding the conditions necessary for accuracy when the method is used. From my own experience and observation in different laboratories, I was convinced some time ago that the results obtained by this method are variable, according to the different conditions under which the precipitation is made. The practice of acidifying the solution after the copper sulphide is thrown down is wrong. The solution should be made acid the first thing and boiled two or three minutes to expel the hydrocyanic acid. Either hydrochloric or sulphuric acid is satisfactory for this purpose. If the acidification is made last, the precipitation of the gold and silver is incomplete, unless an excessive amount of copper sulphate is used. This gives rise to another question: What part does the copper sulphide play in the precipitation of the gold and silver? Is it a precipitating or collecting agent? Both gold and silver are thrown down as sulphides from an acid solution by the addition of a soluble sulphide, and it is quite probable that this is the form in which they are precipitated, and the copper sulphide simply serves to gather them. It is well adapted for this purpose, but has the disadvantage of being easily reduced to metallic copper, and as such it enters the lead button and causes an excessive cupellation loss. It must, therefore, be used in as small a quantity as possible. From a large number of experiments made with varying quantities of copper sulphate I found that one gram of the crystallized salt would give perfect results and check exactly with carefully made evaporation assays. One and a half grams also gave good results, but when two or more grams were used the figures were always low. This was probably due to the effect of the copper on cupellation. In another series of experiments an excess of copper sulphate was added, only a portion being thrown down as sulphide. The results were low in every case, the cause of which I am at a loss to explain.

The particular advantages of this method of assaying are, that it permits of a large sample of solution being taken, and is extremely rapid. The most convenient apparatus for boiling and precipitating the solutions in are agateware saucepans holding about half a litre. Unfortunately they are not very long-lived, as the chemicals soon destroy the enamel and holes are formed. Laboratory lamps or coal-oil stoves should be used for boiling in preference to the



TONOPAH, NEV. MARTIN 1903 E. V. SMITH PHOTO.

TONOPAH, NEVADA.

true not only of lead, lime and iron ores, but at times when an acid flux is desired, the same is true of hard white quartz. The actual cost of smelting is another matter, and varies according to the locality. The cheapest smelting within my knowledge that has ever been done on this coast is being carried on at Keswick, Cal., of course by the pyritic method, which by its faculty for making fuel and flux out of sulphides, is best adapted for very low costs. This, according to data published in the latest volume of the Mineral Industry, was 69 cents per ton, for the three items, coke, wood for heating the blast, and labor. If the additional items of interest on plant, depreciation, repairs, sinking fund, fluxes and general expenses are added, the cost would probably reach a little above \$1 per ton of charge, which is extremely low and compares very favorably with the cost at any smelting works, even the most favored. Six years since I conducted the same sort of work, namely pyritic smelting, at the same locality, and by a curious coincidence, used the same proportion of fuel (2½% on the ore) and made up the charge in a very similar manner. The resemblance between my work and the present extended even to the grade of matte produced, which assayed 19% copper in each case. My cost per ton, counting all the items, including interest and a proportion of the general expenses, was \$1.63 per ton; at that time the lowest figure reached upon the coast, or perhaps anywhere in this country.

At Boundary, B. C., the cost per ton, at one smelter, we are informed, is but \$1.35, which, considering the disadvantageous locality, the condition of the labor market and other circumstances, is exceedingly, almost incredibly, cheap. These three ex-

ago, but the difference is as much or more in the men as in the machines and processes. The happy-go-lucky furnace manager of the past, who was so fond of calling himself practical, has gone from among us, and his place knows him no more. It has been taken by a younger man, of scientific education and training, who brings all the resources of the day to aid him in his work, who keeps up with the times and exchanges ideas and information with the rest of the world. The modern engineer has found, what his predecessor has not, that there are no secrets in metallurgy, no accidental blundering on to combinations, but just a strenuous working out of results by the rules of chemistry and common sense. Smelting of copper is taking its place along with the other scientific operative arts from which the world receives and to which it gives so much.

Tonopah, Nevada.

A little more than two years ago there was nothing where Tonopah now stands. It was about the last of August, 1900, that J. L. Butler located the Mizpah, Sand Grass, Red Plume, Buckhorn, Burro, Desert Queen, Silver Top and Valley View claims, where croppings appeared on the surface, but it was not until the following year that active work was done. During the summer of 1901 a number of leases (over sixty in number) on portions of the group were given, some of whom commenced taking out ore from the surface. These leases expired Jan. 1, 1902, and were all verbal. From these leases up to Jan. 1, 1902, came a large production, which gave Tonopah its first fame. Meantime, in July, 1901, Butler had sold to Philadelphia people for \$336,000,

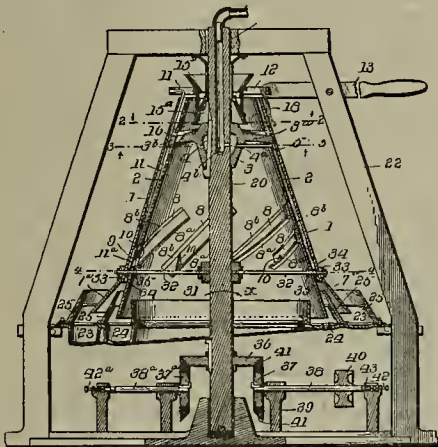
top of the assay furnace. A too rapid generation of heat will cause the solutions to run over with attendant loss. The following is a general description of the method of conducting the assay. The solution is measured out in quantities varying from three to ten assay tons, according to its richness, and brought to boiling. It is then acidified so that it gives a strong reaction with litmus paper. At the end of two or three minutes, twenty cubic centimeters of copper sulphate containing one gram of the salt in solution are added by means of a pipette. As soon as this boils a slight excess of either sodium or potassium sulphide is added to precipitate the copper. The boiling is continued for another minute, or until the evolution of hydrogen-sulphide ceases. Filtration is then made through an eleven-centimeter filter. Some of the precipitate will adhere to the sides of the saucepan and must be removed with a little cold water and rubbing with a finger. After filtering, the precipitate is folded up and placed in front of the muffle in a 2½-inch scorifier. It dries very rapidly and the paper soon catches fire and is consumed. The sulphur also burns and is driven off. Granulated lead and a small amount of borax glass are then added and the whole scorified. As there is very little material to slag off, twenty grams of lead will usually suffice. It is advisable to scorify the button until it is reduced to eight or nine grams. It is then extracted, cupelled and the values calculated. In making the assays considerable time can be saved by boiling three or four solutions at a time. Another way of saving time is to use standard solutions so that the necessary amount of reagents can be added without any unnecessary delay. In this way fifteen or twenty solutions may be prepared for scorification in about three-quarters of an hour. In adding the alkaline sulphide care should be taken not to add in such excess that the solution becomes alkaline again. As soon as all of the copper has been thrown down an excess of sulphide gives a white precipitate of sulphur. This, however, cannot be seen unless the copper sulphide has settled somewhat. Regarding the accuracy of the method, there is no question but that if properly made the results are fully as high as those obtained by any other means.

Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 31, 1903.

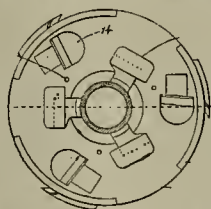
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

CENTRIFUGAL ORE CONCENTRATOR.—No. 723,932; P. H. Shue, Ouray, Colo.



Centrifugal ore separator, combination, inner and outer rotatable casings spaced apart with free passage between them and at discharge end, inner casing having separating openings, ore feed into inner casing, and wash water feed into space between casings.

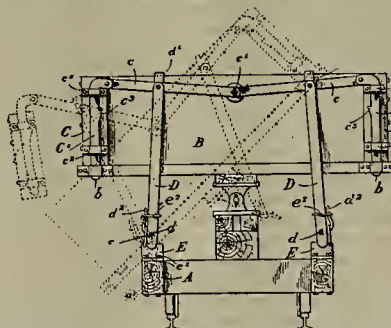
MULLER FOR GRINDING OR AMALGAMATING MILLS.—No. 724,019; E. F. Knotts, Des Moines, Iowa.



In muller, combination of circular body portion having circular opening in central portion thereof and series semicircular openings midway between circular opening and exterior of body portion, body portion also having square-shaped perforation at rear of each semicircular openings, sides to perforations beveled from minimum distance between them at lower edges to maximum at upper edges, shoes for muller, projection on upper surface of each of shoes

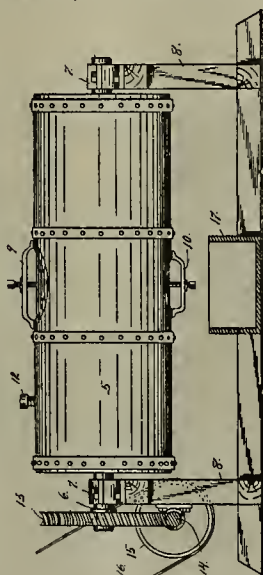
extending upwardly from shoe to which attached, beveled sides for projections to hold shoes in place relative to body portion when placed in perforations, pins for detachably connecting shoe with body portion.

DUMP CAR.—No. 723,921; J. B. Rhodes, Harvey, Ill.



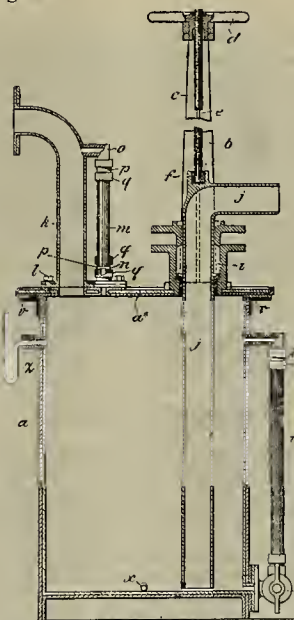
Dump car, comprising truck and tilting body mounted thereon, displaceable side boards, props for producing displacement, sliding connections intermediate of props and side boards, whereby either board free to have slight downward movement with body before displacement produced, and locking devices applied to lower edges of boards adapted to release latter during sliding movement between props and boards, whereby either board unlocked before displacement takes place.

COPPER LEACHING PROCESS.—No. 724,414; G. H. Waterbury, Denver, Colo.



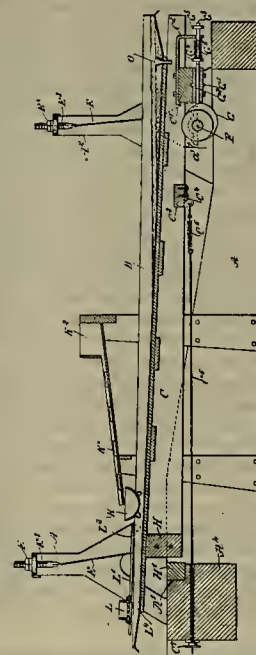
Copper leaching process, consisting placing suitably pulverized ore in tank, adding acid, salt, oxide manganese and water in suitable quantities, heating mass to desired temperature, subjecting pulp to agitation until copper has been dissolved.

APPARATUS FOR EXTRACTION OF PRECIOUS METALS.—No. 724,076; J. B. de Alzugaray and W. A. Mercer, London, England.



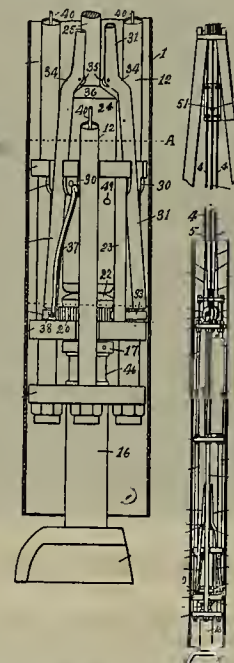
Apparatus for treating ores comprising lead-lined vessel capable of being hermetically closed provided with gage glass and filling device, vertically adjustable air-inlet pipe, outlet pipe provided with inspection glass and means for agitating contents of vessel.

ORE CONCENTRATOR.—No. 723,865; F. W. Harlow, Eureka, Colo.



Ore concentrator having pan mounted swing, actuating device for pan, adjustable controlling device controlling stroke of pan, and governor driven in unison with actuating device automatically adjusting controlling device, and wedge-shaped bumper mounted on slide and adapted to be engaged by bumper block of pan, movement of bumper controlled by governor.

DRILL FOR BORING WELLS.—No. 724,160; W. H. Clark and F. J. Currier, San Francisco, Cal.



In drill, combination, with drill proper, of plate around stem of drill, upper plate, rods connecting plates, levers pivotally supported by upper plate, hammer for driving drill, and provided with means for rocking levers by reciprocation, ratchet wheel for rotating drill, and means rotating ratchet wheel.

PROCESS OF SEPARATING COPPER FROM ORES.—No. 723,949; G. D. Van Arsdale, New York, N. Y.

Separating copper from cupric-sulphate solutions, with or without ferrous or other suitable sulphate and simultaneously producing free sulphuric acid, by adding sulphur dioxide and heating with or without pressure, whereby copper or copper compounds thrown down in solid form, to be subsequently treated, and free sulphuric acid formed and adding acid liquors obtained, after separation from copper precipitate, to copper ores, whereby copper contained is dissolved and original solution regenerated and process repeated.

In the issue of March 21st appeared an illustrated account of the manufacture of Portland cement in California, wherein extended reference was made to the plant of the Pacific Portland Cement Co., and the aerial tramway therein described. Further information is received to the effect that the tramway, which is automatic and efficient, is of the manufacture and build of the A. Leschen & Sons Rope Co., St. Louis, Mo.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence).—The Nome district is progressing favorably in its winter diggings. Anvil and Dexter creek benches, it is estimated, will produce more than \$500,000 as their share of the winter output. Peeluk and Martin's creek claims are good for \$50,000, Bourhon and Dry creek benches for \$100,000. On Solomon river a paystreak of 3 feet, averaging 25 cents to the pan, has been found on No. 7 below, and a big winter dump is being taken out. On Mystory creek, tributary to Solomon, seven claims are being worked and a good result is promised. A quartz claim is being developed on West creek, a tributary of Shovel creek, \$8 ore being taken out. Daniels creek benches are being worked extensively, with good pay. Ophir creek benches are also being worked, but less than last winter. It is a summer camp and can be more economically worked by sluicing. On the Inmashuk river, flowing into Good Hope bay, some good prospects were found during the fall and a stampede is expected next summer to that region.

The town of Nome has undergone some transformation since last fall. A number of empty cabins and houses have been moved to the creeks adjoining Nome, so that more people are living on their own claims than during any previous winter. This makes business in the town dull, but it is evident that the adjoining territory is being developed. There are 500 people in the Good Hope district, camped on claims, which are being prospected or which will be worked early in the spring. A large number of laborers will be in demand next summer. Great activity is evident among the mining companies represented here. Some are transporting supplies, machinery and lumber to their claims; some, like the Alaska G. M. Co., are prospecting the beach and the sands of the Bering sea ½ mile off shore. The manager claims to have found prospects which justify the erection of sand pumps on the ice until the drifting out of the ice from shore.

Open gambling in town has been stopped by order of the Department of Justice at Washington.

Lumber is scarce here, especially 2-inch planks. The winter has been very cold, as low as 50° below zero a few days ago. The first mail of the season has arrived. Nome, Jan. 26.

(Special Correspondence).—The first mining we found after leaving the steamer was at White Horse, Yukon district. There we were shown some samples of copper ore, said to run as high as 47%; saw the croppings on the trail to Dawson, about 4 miles out of White Horse; was told that one lot of 100 tons sampled 12% copper. It all carries some gold and silver. A shipment of 180 tons was sent out from the Glatfer mine.

The Transportation Co. and smelter at Crofton, B. C., have made a rate of \$10 per ton from White Horse. Lack of funds seems to be in the way of any extensive development.

On our way down the Yukon we saw extensive gravel deposits, all said to carry some gold, but do not think enough to pay here. I have seen some of the crudest and most expensive methods for handling gravel here ever invented. All estimates here are so many cents to the pan. There is a small amount of mining on El Dorado and Bonanza creeks. I was informed that it will be the smallest production of any season in the history of the Klondike.

After we left Forty Mile, on the Yukon, we saw fifty men "burning ground," as it is called on the Forty Mile river. Some were making wages, some not even grub. In some places the gravel was 6 inches and in others 2 feet—all shallow.

All the gold I saw from Forty Mile was fine—no nuggets over 50 cents. At Steel creek I saw some fine nuggets from Jack Wade creek, the largest \$300 and a lot of \$2 to \$10. Saw some fine quartz and gold from Chicken creek—about ½ inch stringers; looks like California pocket quartz; only a pocket, so far, on Chicken.

Indications are favorable for some good quartz discoveries in this country. Our camp is ½ mile from the main trail to the Tanana, the Mecca of all stampedeers now. They pass here singly, in pairs, and in droves, in all kinds of conditions—hand sleds, dog sleds, mules and horses. Some of the most brutal sights are seen here; some men abuse and starve their poor dogs and horses shamefully. All reports here so far are that it is good pay—a lot of gravel, no big bonanzas.

I think enough men have gone in this

winter to stake the Tanana and all its tributaries.

Eagle City, March 15.

Manager R. Day of the Mansfield G. M. Co. is putting up an hydraulic plant and a sawmill on McGinnis creek, near Juneau.

The Alaska Petroleum & Coal Co. are operating at Galiano, in Kyak district, 100 miles east of Valdez, says Manager Lippy. Their holdings are on the mainland, opposite Kyak island.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—The Marquette & Arizona M. Co. is erecting a 25 H. P. hoist on its property and sinking the shaft, now down 100 feet. Ore runs \$19 gold and 4% copper; have about ten tons on the dump. E. Marks is manager. Bisbee, April 1.

The Tombstone Con. M. Co. at Tombstone report the 700-foot level station in the shaft timbered and drifts started. The pumps are handling 1,700,000 gallons of water per day. They will open up other claims in their group.

The Mitchell Dev. Co. have begun work on their group in the Huachuca mountains, near Bisbee. A tunnel is being run to connect with the main shaft and ore is being opened up.

COCONINO COUNTY.

H. J. Beemer of the United States G. & P. M. Co. says the company will hereafter make Williams, instead of Seligman, the point from which all operations will be carried on.

GILA COUNTY.

Superintendent E. H. Benson of the Black Warrior C. Co., Amalgamated, near Globe, says the leaching plant will be in operation next week.

MARICOPA COUNTY.

J. A. Wishart has men at work near the upper box canyon, near Wickenburg, testing the gravel beds and mesas for placer gold preparatory to putting in a steam shovel. A well is being sunk on the bank of the river and a gasoline engine and pump set up.

MOHAVE COUNTY.

At the Chumax mine, near Kingman, Super J. Dundon reports opening gold ore, averaging 10% copper and \$30 gold per ton. Water is coming in the shaft and machinery will have to be put in. Manager S. C. Bagg, at the New Comstock mill, is getting things in shape for a run.

PINAL COUNTY.

Superintendent F. Brownell of the Producer Co., near Casa Grande, says machinery for a steam hoist, air compressor, boilers and a portion of the 50-ton smelting plant is on the ground.

Superintendent J. T. Garrison reports finding a body of silver ore in one of the Siggins copper claims, 1½ mile above the headgate of the Florence canal, says the Florence Blade. He is down 40 feet on the vein and the entire shaft shows silver glance, which also carries some copper.

The Arizona-Pacific C. Co., composed of Indiana men, are operating the Ritsch-Henry mines near Florence, and a steam hoist is being put up, says J. W. Sharpe, vice-president and manager.

SANTA CRUZ COUNTY.

The Mercedes C. Co. has incorporated at Nogales; O. K. Franklin, H. A. Smith and J. Dessart.

YAVAPAI COUNTY.

The Denver Onyx & Marble Co. is reported to have bought the D. Bowen onyx claims at Mayer. They will begin operations next week and put in machinery to prepare the stone for market.

The Poland mill at Poland is reported closed down, throwing 100 men out of work. Although the company proposes changing the process of treating ore, it is said that the close down was decided on principally as the result of the eight-hour law passed by the last Legislature.

J. Elder of the Geo. A. Treadwell Co., near Jerome, says that at the Brookshire group the principal work being done is driving the tunnel, which will be continued another 100 feet to tap other workings. A diamond drill will be put at work.

G. Scammel, superintendent of the Hassayampa Dredging Co., says a dredger will be put on their placer claims on the Hassayampa, above Walnut Grove. It will have a capacity of 1000 yards daily. The company estimates that the dirt will yield 50 cents per yard. Water will be pumped for washing the dirt until the water level is reached with the dredger.

The first time in many months the United Verde has been unable to secure all the men it needed occurred last week, says the Reporter. The fourth of the

small furnaces was blown in and the high furnace is ready for operation.

Superintendent Pickereil of the Gold C. Con. M. Co. has his shaft on the Rockefeller mine of the President group, 12 miles south of Prescott, down 620 feet. The 10-stamp mill and the 50-ton cyanide plant were started up this week. The ore is a sulphide and carries \$30 per ton in gold. He has thirty men at work.

At Mayer a strike is reported made in the French Lily in Crazy Basin district, under bond and leased to G. W. Middleton. In the drift on the 200-foot level a body of ore has been struck assaying 15% copper and \$35 in gold.

J. R. Thomas of the Black Hills & Minus C. Co., near Jerome, says, at the Black Hills, machinery has been put in and sinking resumed. On the Minus one shaft has followed the ore down 100 feet and they are crosscutting at this point. The rock assays 7% copper, with values in gold and silver.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—The report is current that the miners have decided to insist on the recognition of the union. Several meetings have been held with representatives of the Western Federation of Miners, who have advised the union men how to proceed. They intend to demand an increase in wages.

There are about 1200 miners in Amador county, of whom a large number are members of the union, and others will be compelled to join or they will not be allowed to work. There is a possibility of the strike extending throughout the several Mother Lode counties before a settlement is reached.

W. F. Detert, superintendent of the Zella mine at Jackson, D. McClure, superintendent of the Gwin mine in Calaveras county, and John Ross, Jr., superintendent of the Wildman-Mahoney mines at Sutter Creek, have been appointed to formulate a reply to the demands of the miners. This will be done within a week. What the reply will be has not been made public, but it is believed that as the present condition of most of the mines will not justify an increase in wages or a decrease in working hours, that the demands of the Miners' Union will be refused.

Jackson, April 8.

A committee of the Jackson Miners' Union waited on the superintendents of the Zella, Kennedy, Onaida and other mines last week with a written statement of demands which includes recognition of the union, reduction of the working day to eight hours and the reinstatement of men alleged to have been discharged because affiliated with the union. The companies are given ten days to consider these demands.

CALAVERAS COUNTY.

(Special Correspondence).—The Pioneer Chief mine, near San Andreas, which was recently bonded by Dr. Foster of New York City, is to be reopened. The mine was developed to a depth of several hundred feet, but has been idle many years. The vein, which is found at contact of greenstone and slate, contains much calcite with quartz and iron sulphides.

The Calaveritas hydraulic mine, 2 miles north of Fourth Crossing, is in operation under direction of Dr. Nelson, who bought the property last fall and has spent a large amount in its equipment.

San Andreas, April 5.

The Vornich M. Co. has been incorporated to operate the mines of the Vornich Bros. on Bear mountain, about 5 miles from Angels. One shaft is down 125 feet. A hoist will be put up and the shaft sunk to 600 feet.

KERN COUNTY.

(Special Correspondence).—The 10-stamp mill of the Echo M. Co. of Los Angeles, Cal., 5 miles west of the village of Mojave, is running steadily on good ore. A cyanide plant is being built to work the tailings direct, there being no intermediate concentration, all the ore being oxidized. At the Queen Esther mine, near the Echo, a 100-ton roller mill is being put in.

Mojave, April 7.

The Associated Oil Co. will erect a 250,000 barrel reservoir at McKittrick. The Southern Pacific Oil Co. began pumping two new oil wells last week and expect to sink twenty-five more wells this season. The Standard Oil Co. is erecting four reservoirs at the Kern River field, near Bakersfield, a capacity of 350,000 barrels each. They will be 300 feet in diameter.

The Fulton Oil Co. has incorporated to operate at Sunset; G. Bradley, R. L. Mann, R. W. Hart, B. Romains of San Francisco, and S. Maine of Bakersfield.

Manager J. R. Johnson is reopening the St. Elmo group of mines, 5 miles from Randshurg. A gasoline engine has been

put in and a cyanide plant is proposed.

W. F. Ernst has leased the Plunmore mine and mill, near Johannesburg, and has men at work.

The War Eagle M. Co. has opened up a large body of low-grade ore in the bottom of the shaft, the ledge dipping nearly vertical, says Superintendent Castro. The War Eagle adjoins the Yellow Aster, near Randshurg.

LOS ANGELES COUNTY.

The California D. & E. Co. has incorporated at Los Angeles, A. E. Clark, G. O. Pearce, E. D. Bryant, J. Binney, L. Stair, H. H. Sheffield, W. J. Bryant, J. M. Brown and J. M. Cummings, to build and operate at tide water near San Pedro a smelter with daily capacity of reducing 1000 tons of ore.

MARIPOSA COUNTY.

Work has resumed on the Pine Tree tunnel to develop the Pine Tree and Josephine mines near Bear valley. Men are at work cleaning out and retimbering the tunnel which begins at the Benton millsite. It is in 2000 feet and will be driven ahead to tap the ledge.

H. C. Austin et al have bonded the Dusenberry claim at Whitlock. They intend to put in a gasoline engine and pump.

MONO COUNTY.

The Standard Con. M. Co., at Bodie, are overhauling their cyanide plant and expect to resume next week.

NEVADA COUNTY.

For the past three months the Le Compton M. Co. has been working on a 2 foot ledge of ore, 1 foot of which assays \$200, says W. H. Dunlap, president and manager. The remaining 12 inches runs \$20 per ton. The mine is on Deer creek, 3 miles from Nevada City, and has attained a depth of 420 feet, the country rock being granite. The ore is free milling and carries sulphides. The mill handles only the lower grade rock, the other being shipped to the smelter. Five more stamps will be added to the mill and heavier pumps put in at the shaft this spring. There are twenty-seven men on the payroll.

President J. D. Hague of the North Star M. Co., near Grass Valley, in his annual report says the important development of the year has been the opening up of an ore shoot on the east 1100 foot level of the old workings. This ore body is shown to be 100 feet in length along the course of the vein, extending downward from 1100 to 190-foot level (45 feet on dip of vein), and thence continuing below the 1900, where sinking has been started. The deeper working from the Central shaft indicates the continuance of this ore body below the present showing in the 1100-1900 block. From this block there were mined during the year 7204 tons of ore, yielding \$43.76 per ton, at a cost of \$9.48 per ton. The vein area, about 16,000 square feet, worked out in mining this ore, is one-third of the estimated vein area of the ore body above the 1900. During the year there were mined from the deep workings of the Central shaft 10,195 tons of ore, yielding \$9.40 per ton, at a cost of \$3.42 per ton. The total value produced from the mine amounted to \$411,147.98, with operating cost of \$154,227.66 (an operating profit of \$256,920.32, which has been sufficient to cover outlays during the year on development and equipment accounts of \$112,395.47).

A 20-inch ledge of high-grade ore is reported struck in an upraise from the 20-foot level of the Eddy mine. The Eddy is an extension of the Pennsylvania, and is on Cement Hill ridge, northwest of Nevada City. W. W. Kirkham is president and manager.

C. G. Mitchell has found pay gravel on his ranch, near Grass Valley, and has begun placering, with several men at work.

Superintendent Cassaway of the Union Blue Gravel mine at North Bloomfield is making preparations to add ten stamps to their 10-stamp mill this spring. He has fifty men at work. A locomotive is used in the main tunnel hauling twenty-five loaded cars to the mill each trip.

Superintendent C. A. Brockington of the New Orleans mine, near Grass Valley, says they have struck the Hueston Hill vein for which they have been prospecting for some time. At the 700-foot level a crosscut was run into the footwall and a raise driven on a water course opened, and at 165 feet from the crosscut the vein was found, showing 6 feet with values in free gold, galena and pyrite.

SAN DIEGO COUNTY.

The Picacho mine, near Yuma, made its first shipment of gold bullion last week, being two bars worth \$40,000, says the Citizen.

SACRAMENTO COUNTY.

The Blue Ravine M. Co., near Folsom, are operating a driller, prospecting new ground near the present mine.

SAN BERNARDINO COUNTY.

Placer gold is reported in the Sacramento wash near Needles. It is a dry wash proposition, and a rush has taken place to the district. A find is also reported near Black's Peak, 45 miles from Ilex, the strike being made by H. Butler and G. King while looking for oil prospects. This is also in the Sacramento wash, and northwest of Needles.

The sale of the Bagdad mines at Ludlow is off, the bond lapsing. The Bagdad M. & M. Co. retains the property. The mines are 8 miles south of Ludlow, on the Santa Fe road, below Barstow. A railroad has been started from Ludlow to the mines, called the Ludlow and Southern. Work at the mines has stopped and the mill at Barstow, owned by the company, will be overhauled and additional machinery put in. E. H. Stagg, of Johannesburg (Kern county), is manager.

SAN DIEGO COUNTY.

The California Q. M. Co. has incorporated at San Diego; J. M. Steade, E. Booker, O. G. Douglas, H. A. Croghan, C. Myers, C. E. Anthony and E. Daney.

SHASTA COUNTY.

Work has been resumed on the power plant to be installed by the Northern California Power Co. on Cow creek, near Redding, which was suspended as a result of the strike at Iron Mountain and Keswick, says Superintendent E. V. D. Johnson.

Superintendent Scott of the Great Western G. Co., operating the Afterthought mine, near Bella Vista, says machinery is arriving on the ground for the smelter and power house. An air compressor and power drills are being put in. At the mine on the No. 2 level the shoot opened up is showing 10% copper, \$5 in gold and 100 ounces of silver per ton.

Redding reports ten mining locations filed for the week ending April 4.

There are now at the Iron Mountain mine 260 men, and at the smelter 390, working for the Iron Mountain Copper Co. Another furnace has been blown in and the converters started.

SIERRA COUNTY.

The Red Ravine gravel mine at the head of Nelson creek on the line between Sierra and Plumas counties, near Downieville, is reported sold to a San Francisco company, D. Jones of Downieville, superintendent, for \$50,000. A tunnel will be run in to cut the channel and a sawmill will be put up.

SISKIYOU COUNTY.

The Condrey quartz mine on Klamath river at Riverside, near Yreka, has been bonded to Manager Johnson of a San Francisco company for \$80,000. Whitney & Co. have begun work in a placer claim below Riverside on Klamath river, to be worked by the hydraulic elevator. Carlock & Morrison have their quartz mine in good shape again since the fire of a month ago. The machinery was but slightly damaged. The pumps were kept in operation to prevent the filling of shafts until the buildings were rebuilt.

At the Double Eagle mine on Barkhouse creek near the Commodore mine, near Yreka, being worked under Quigley & Barton, the owners, 900 feet of drifting and tunneling has been done during the winter.

With the electric power plants in operation the coming summer, it is expected the Greenhorn blue gravel mine, near Yreka, will be reopened, as the expense of pumping the water will be greatly cheapened, firewood for steam being high.

TUOLUMNE COUNTY.

The Olson mine, near Cooperstown, has shut down, says the Magnet.

At the Prudhomme mine, near Carters, the ore chute is being opened up and run on the 300-foot level, north and south. The company will sink an additional 200 feet and add five stamps to the mill, says the New Era.

The Violet quartz mine, adjoining the Cosmopolite mine, has been bonded to J. Chapman of Groveland for one year.

The Mt. Lily mine, near Sonora, has been compelled to shut down temporarily on account of a cave and water coming in at the upper tunnel.

To J. R. Middlemiss of New York and L. M. Cutting of Stockton has been deeded in trust for the Rawhide Chief M. Co., the Black Slate and Tappi lode claims, 1 mile north of the Rawhide mine, near Jamestown, including all improvements, for \$5000.

The Mountain Belle and Parallel mines, at Soulsbyville, north of the Soulsby mine, were sold last week to W. Sharwood, who has been working them for the past three months.

It is reported in the Little Bonanza pocket mine, at Sonora, a rich pocket is being taken out. The mine is under lease to E. & A. Deleray, A. A. Grant and D. R. Oliver.

VENTURA COUNTY.

C. A. Burrows finished up a well in Wheeler canyon, near Fillmore, last week, which gives fifty barrels per day. After a shut down of two months the Sespe Canyon Oil Co. have resumed work on their lease. The Tapo Oil Co. has a lease on the Sutherland Hutton ground, near Buckhorn, and has begun drilling. The Sulphur Mountain Petroleum Co. of Fullerton (Orange county), drilling on Sulphur mountain, near Fillmore, has brought in a well at a depth of 2000 feet. Work has resumed on the Northern Oil Co.'s ground under lease to the Seaboard Con. Co. of Chicago, Ill.

COLORADO.

BOULDER COUNTY.

A hoisting plant has been put up on the Golden Eagle mine, near Eldora, and development work begun.

A bond and lease has been given on the Cream lode, near Eldora, to J. Luxon, J. L. Misner, M. Meyer, L. Algire and C. Gilbert of Boulder. There is a tunnel in 400 feet and a shaft 75 feet deep. The Cream lode adjoins the Melvina on the east.

The Boulder Illuminating Oil Co., owned by W. P. Bonbright et al. of Colorado Springs, has begun pumping its well near Boulder. This well is near the Otero and the Savannah.

At the Wood Mountain mill, near Wall Street, the stamp battery is in operation and a Huntington mill is being put in, which will give them a capacity of 100 tons per day. They are milling ore from 150 feet below Four Mile Creek bottom. J. J. Morris is superintendent.

A. Brown, manager of the Wano M. Co. at Jamestown, says his company will build a cyanide mill of fifty tons daily capacity at the mine. The vein on the Wano is 40 feet wide, average value \$10 per ton.

CHAFFEE COUNTY.

The management of the St. Joseph G. M. & M. Co. expect to start work on their group near Granite next week. The Magenta shaft will be cleaned out and sunk deeper, and at the same time work will be started on the Emma claim and the Magenta mill will be put in operation.

It is reported the New Year's mine at Granite, operated by the Elkins M. & L. Co. of Cripple Creek, has opened a vein of ore, 3 inches of which are running twenty-five ounces per ton in gold.

CLEAR CREEK COUNTY.

The report of the secretary of the Empire Tunnel Co. at Georgetown for March shows with two machine drills the tunnel was driven 186 feet during the month at an average cost of \$10.39 per foot. This tunnel is an 8x8 foot, crosscut in 2040 feet, being driven through granite. To break the rock an average of eighty-four pounds of powder were used each day.

At the Waldorf mine, near Georgetown, it is proposed to erect concentrating works at the mine and to increase development, says Manager E. J. Wilcox.

Work on the Wilcox tunnel, near Georgetown, during March advanced the face 180 feet, making a total of 1380 feet.

Sinking was resumed at the Russell mine, near Russell gulch, last week at a depth of 235 feet, and will go down at least 100 feet deeper. Cleveland, O., parties are interested and A. Thompson is superintendent.

DOLORES COUNTY.

At the Emma group of mines, 1/2 mile below Dunton, thirty stamps will be added to the 20 stamp mill. During the past year the mine and mill have been employing 125 men, the output being 150 tons of mineral daily. With the addition they expect to reduce 300 tons per day. The 3000 feet of vein matter on the Emma has been opened by five levels. R. Keller of Dunton is manager.

Near the Emma mine, near Dunton, the Mount Gorman group, owned by a Milwaukee company, the 10-stamp mill is in operation, and it is proposed to increase it to 20 stamps.

EL PASO COUNTY.

The United States R. & R. Co. say work will be started next week on the chlorine gas plant to be erected at Colorado City in conjunction with their Standard and Colorado plants. A second chlorine plant will be erected at Florence in connection with the United States plants at that place. The cost of each unit will be \$50,000. By means of this plant chlorine is manufactured electrically at a saving over the present method of using lime and sulphuric acid. The patents to the new process are owned by the United States Co.

FREMONT COUNTY.

The Lohach Oil & R. Co. was organized at Florence last week and will operate in the Frazar orchard. Drilling will begin next week. A. Gullinger is manager.

GILPIN COUNTY.

A local pool at Central City has a lease on the Wood group in Leavenworth gulch which has produced uranium ores. It has been idle for three years. Shipments have been made to Europe, the ore averaging 20% uranium. Further development work will be done.

Work has resumed on the tunnel proposition of the Swiss G. M. & R. Co. at the head of Moon gulch, near Rollinsville.

At the Saratoga, near Central City, a new "boh" for the Cornish pump has been put in at the 800-foot level. An assay office building has been erected and equipped.

The Oro Verde M. & M. Co., J. C. Williams of Chicago, Ill., vice-president, is operating between Silver creek and Mammoth gulch, near Central City. An 18 foot vein has been opened up on the 800-foot level. The company intends to put in an air compressor next summer and the main tunnel driven ahead to cut the veins exposed on the surface. G. P. Goodier is superintendent.

The Seaman tunnel has been started in from Fall river, near Yankee, to run through the Yankee district to cut a group of claims. The tunnel will be 8x8 feet in the clear, with double tracks.

The Grand Central Co. of Colorado City, which owns the East Whiting mine at Central City, has decided to build a 15-stamp mill to handle its low-grade product. On the third level the vein is 6 feet wide, the smelter product averaging \$30 a ton and shipments ten tons a day. The low grade runs \$7 a ton. The main shaft, which is 480 feet deep, will be sunk to 680 feet, and new levels run out to open the vein at each 100 feet, says Manager H. D. McMasters.

HINSDALE COUNTY.

Work has been resumed by the Henson Creek L. M. Co. near San Juan. The hoist and power plant were completed in February, but work was temporarily suspended on account of the heavy snow. The mill is expected to be finished by May 15.

LA PLATA COUNTY.

The plant of the American S. & R. Co. at Durango is being enlarged. It is at present treating an average of 300 tons of ore and concentrates daily, and this will be increased to 450 tons.

LAKE COUNTY.

The Denver Times says an encouraging feature in the present mining conditions at Leadville is the increased demand for oxidized iron material, and as a result there are a number of properties enabled to ship that for some time have been idle. Also, it is reported the Republic smelter, controlled by the same parties which own the Salida plant, will be remodeled and operated as a pyritic smelter, handling a lower grade material than that now smelted.

The Sharp G. M. Association, near Leadville, are down 70 feet in shaft No. 5, and in the first porphyry overlying the lime. They have not found hand power sufficient to push the work as fast as they desire and will install an engine and boiler.

The News-Dispatch says the destruction by fire of the Canon City smelter has been a serious inconvenience to a number of the mines around Leadville, from which zinc-lead ores were being shipped.

At the Valentine mine, near Leadville, Manager Shadbolt says they will put down several drill holes south of the shaft to locate the ore body. One drift south of the shaft has been driven 150 feet.

The Yak tunnel, driven in from California gulch, near Leadville, last week, cut the drill hole sunk from the bottom of the Ibex shaft, draining the Ibex workings.

The Blue Ribbon shaft at Leadville is being sunk by lessees and has reached the blue lime at 120 feet. Water is coming in, but they expect to be able to handle it with a bailer until they sink another 50 feet. At 150 feet they expect to strike the ore channel.

Manager Brooks says he will begin operations next week on the Vega shaft, owned by the Vega M. Co., and joining the Diamond M. Co. on the northeast, near Leadville.

T. Kyle, manager of the Boulder mine in Big Evans gulch, near Leadville, struck a heavy flow of water in the new shaft last week. When down 410 feet the sudden influx of water drove the miners out of the shaft. It rose to an adit 40 feet below the surface.

The Breece Hill cyanide mill at Leadville has had additional rollers and pipes put in and resumed this week.

SAGUACHE COUNTY.

The Crown Point M. & L. Co. has incorporated; F. M. Symes, D. J. Carlin, T. C. Brown, F. Eakins, J. G. Huntington and F. M. Woods directors. They have a three-years' lease on the south 750

feet of the Crown Point, Klondike and Homestake lodes of the Central Colorado G. M. Co. in the Klondike (Finley gulch) district, 9 miles north of Saguache, and have begun operations. The Daisy Dean shaft has been unwatered and is being enlarged to 8x4 in the clear. At the 200-foot level a crosscut will be run to the Klondike shaft. A gasoline hoist will be put in and a mill later on.

SAN JUAN COUNTY.

Superintendent Lonergan of the Wabuse M. Co. in Hematite basin, near Silverton, says the 100-foot winze sunk from the Little Annie tunnel is finished and a drift from the bottom has cut 28 feet of milling ore. The group will be developed by tunnels to greater depths and a mill will be erected.

A. V. Shaw and A. W. Degenhart have a three-year lease on the Boston-Auburn Co. group on Tower mountain, near Silverton. They have two veins of ore carrying lead, silver and copper, and propose building a tram from the property, a distance of 1/2 of a mile, to the railroad near Middleton.

It is reported the Colorado C., G. M. Co. will resume work on their Crown Prince group of three claims in Prospect basin, near Silverton. The Crown Prince adjoins the Henrietta and is opened by a tunnel 280 feet in length. D. S. O'Brien of Beloit, Kan., is president.

SAN MIGUEL COUNTY.

C. Anderson, manager of the Nellie and Ella mines, in Bear creek, owned by the San Miguel Con. G. M. Co., near Telluride, states that the tramway, 1 1/2 miles in length, connecting the mines with the Bear Creek 120-stamp mill of the same company, is in operation and forty stamps are dropping. The Nellie and Ella product is free-milling ore, soft and easily crushed, and nine-tenths of the values are saved by amalgamation.

The tramway and the mill at the Nellie mine, near Telluride, have been repaired and work resumed this week.

SUMMIT COUNTY.

Hoyle & Hoyle, operating the Puzzle and Puzzle Extension mines and the West Side concentrating mill, near Breckenridge, report in driving an upraise from the main tunnel level, 800 feet from the raise to connect with the Puzzle Extension shaft, they have struck a foot of ore, 8 inches of which is heavy silver-lead smelting material.

TELLER COUNTY.

(Special Correspondence)—The Glohe M. & R. Co. are remodeling the Van Fleet sampler at Gold Fields, converting it into a 100 ton mill, designed to crush to 1/2 inch mesh and treat ores direct without roasting. There is considerable ore below \$8 which will not pay to ship out of the district to custom mills, and which is oxidized, requiring no roasting. The ore from the Iron Clad groups is of this nature. This company will treat their own ores from the Iron Clad and custom ores as well. The work of remodeling this mill is under the direction of C. T. Durell, a Montana cyanide man and mine manager. Cripple Creek, April 4.

The August Flower L. Co., operating on the Katinka group of claims on Guyot hill, Cripple Creek, will put in machinery at the three-compartment shaft, including a 7-drill compressor and a direct acting hoist, capacity 1000 feet. On the 600 foot level of the mine, in a south drift from the shaft, a granite dike has been cut and an ore body opened up. The ore is being broken 4 feet in width. The work of extending the 700-foot level to the ore shoot is in progress.

Shipments have begun from the Dead Shot Co. ground on Rosebud hill, Cripple Creek, which is being worked by Satterlee & Co., sub-lessees under Brandt & Estell.

All of the mines at Cripple Creek which had suspended operations due to the strike resumed on the 1st and 2d inst.

There are fifteen sets of lessees operating on the properties of the Gold Dollar Con. Co. on Bull hill, Cripple Creek, including two sets working on the dump, and a total output of 300 tons of ore per month is being shipped. The best showing is in the Griggs lease, who are operating on the fifth level north of the main working shaft, breaking 20 inches of ore which averages \$50 to the ton in gold.

During March the smelters and reduction plants treating Cripple Creek ores crushed and treated 53,860 tons of ore, valued at \$1,849,270, an increase of 2186 tons, valued at \$197,300 over the amount treated in February. This, too, in face of a number of mines closed for the last half of the month. From the regular tonnage there was cut off by the close down of Stratton's Independence mine alone a daily tonnage of 250 tons. Besides that the Isabella, the Elkton, the Ajax, the Strong and the Gold King did not ship for that period. The increase is accounted

for, says the Times, by the reason that when the order went out that no more ore could be shipped to the Standard plant pending the labor situation, every one made an effort to break and ship all the ore possible before the order took effect; also the samplers of the district always carry a large stock of ore on hand and when the trouble was approaching they unloaded the reserve they had in the ore bins.

The Doctor-Jack Pot Co. at Cripple Creek has granted a year's lease to W. S. Ames, in the Davenport shaft.

The Shannon G. M. Co. have leased their ground at Cripple Creek to C. M. Sheffer for two years at 20% royalty. The terms of the lease permit him to prospect for sixty days, from which date his lease is to begin. All working shafts must be vertical, but prospect shafts may follow the vein.

The Granite M. Co., operating on Battle mountain, near Cripple Creek, has opened up the ore shoot in the sixth level, which was last year found in the 1000-foot level. The ore averages \$40 per ton and shipments have begun.

The Globe M. & R. Co., of which W. G. Rice and W. O. Temple of Cripple Creek are principal owners, report the work of remodeling the Van Fleet sampler into a 200-ton cyanide plant progressing and it is expected to be in operation by May 1. This company has a five years' lease on the Ironclad mine on Ironclad hill, near Cripple Creek. A complete plant of machinery is being put up on the Ironclad for mining purposes and a shaft house erected. The main shaft is down 700 feet and considerable lateral work has been done.

Sinking the main shaft on the Ophir claim on Raven hill, Cripple Creek, has been started up again after a cessation of several months. Driving the tunnel has been suspended until the shaft is completed. This tunnel will cut the shaft at a depth of 270 feet. The shaft will go to 300 feet.

The Valley City L. Co., having a bond and lease on the Shurtloff group on Bull hill, Cripple Creek, have deposited \$150,000 to take up the bond on the property as soon as the owners, Becker & Nolan of Colorado Springs, can furnish a clear title, says the Colorado Springs Gazette. The company completed the work of sinking last month as required by the terms of their lease, and the shaft is down 1000 feet, with stations cut at intervals of 100 feet. The ore was first found in the shaft at a depth of 700 feet and is being opened on several levels.

IDAHO.

CUSTER COUNTY.

L. Green, manager of the Clayton M. & S. Co., whose furnaces and mines are at Clayton, says operations will resume next week.

The owners of the Fred Pratt and the Ready Bullion mines, adjoining the Lost Packer, near Mackay, have organized the Idaho Central G. M. & M. Co.

BINOHAM COUNTY.

The White Knob smelter at Blackfoot resumed operations last week and will handle 300 tons of ore per day. The ore runs \$12 a ton. A tunnel 300 feet long has been driven into the group, connecting with the shaft 700 feet in depth. An electric road of 10 miles carries the ore from the mine to the reduction works. There are fifty men at work in the mine. A 4 drill compressor has been set up temporarily, pending the arrival of a 10-drill compressor.

BOISE COUNTY.

A. H. and S. T. Godde of Salt Lake City, Utah, have a bond on the Ella Hill group of five claims at Neal, for one year, for \$60,000, and will begin development next week.

The Robinson & Wood M. Co. have begun operations in Boyle gulch, near Placerville.

IDAHO COUNTY.

The Governor has appointed F. E. Johnnes superintendent of the road to be built to Thunder Mountain from Warren's ranch, for which the State appropriated \$20,000, contingent upon an equal amount being raised by private persons. The sum will be paid by mining companies having interests in the district. The proposed road will be about 70 miles in length.

T. S. Hogan, secretary and treasurer of the Crooked River M. Co. at Oro Grande, in the Buffalo Hump country, near Hump, says a 40-stamp mill will be put in this spring, in addition to the twenty now in operation. The ore is free milling gold and carries sulphides.

SHOSHONE COUNTY.

J. L. Dunn, part owner of the Wild Rose mine at Pierce City, says the mill will be started up next week. During the

winter miners have been doing development work.

The assay office of the Empire State-Idaho M. & D. Co. has been completed at its mill near Kellogg. The building and outfit cost \$2000.

WASHINGTON COUNTY.

E. D. Ford of the Gold Coin M. Co., in Black Lake district, near Council, reports the cyanide plant in operation, and that the capacity of the mill will be increased.

MICHIGAN.

CHIPEWA COUNTY.

Superintendent Ashton of the Copper Queen mine, north of Sault Ste Marie, says a boiler, compressor and hoist are being put in.

HOUGHTON COUNTY.

The March output of the Winona amounted to 71 tons 160 pounds. In addition, the Winona secured 9 tons 1752 pounds of refined copper from mass. The total production since the single head at the Atlantic was secured (Dec. 6) has been 289 tons 1694 pounds.

At No 2 shaft of the Trimountain mine, near Hancock, in eight-hour shifts, 100 skips are hoisted (two tons each).

Houghton advises report the March product of the Mohawk amounted to 397 tons; Quincy, 1056½ tons; Champion, 582 tons; Atlantic, 303 tons; Wolverine, 510 tons.

The Quincy M. Co. at Hancock has contracted with the Houghton County Electric Light Co. for all power to be used by the company in its mine, including motors in the shops and fourteen electric locomotives underground. The Quincy Co. has determined that electricity is more economical than steam and finds it more profitable to contract with the electric light company than to put in an electric plant of its own.

The Mohawk mine, near Houghton, in the annual report for 1902, shows: Received from sales of mohawite, \$77,991; 226,824 pounds copper, at 11 65c, \$26,425; expended at mine, \$446,070; other expenses, \$17,361. The rock stamped in December was 8613 tons, which yielded 226,824 pounds of refined copper—an average of 26 34 pounds per ton. Rock stamped in January and February, 1903, was 40 473 tons, which gave 993,064 pounds of refined copper—an average of 24½ pounds per ton. The rock at the Mohawk mine seems to be harder than at the Wolverine, as the Mohawk mill does not as yet stamp as much rock per head as is stamped at the Wolverine.

MONTANA.

CASCADE COUNTY.

W. G. Conrad, interested in the Queen of the Hills, the Galt and other properties at Nelhart, says arrangements are being made to build a concentrator. The Diamond R. concentrator at Nelhart has been shut down for some time on account of litigation.

The Cottonwood Coal Co., of which J. J. Hill is the principal stockholder, has bought 1000 acres of coal land near Stockett for \$30,000. The Cottonwood Coal Co. has extensive interests in the Stockett fields, and from this source is obtained fuel for the engines on the Montana Central and western divisions of the Great Northern railroad.

FERGUSON COUNTY.

The Big Elk G. M. & M. Co. has incorporated at Lewistown; L. D. Lively, E. E. Briley and W. L. Farnsworth.

E. W. King and W. McClean, operating in the Little Rockies near Lewistown, say a 100-ton mill will be erected on the Putnam & Zortman group. Both cyaniding and shipping ores have been found.

The Mammoth Group G. M. Co. has incorporated at Lewistown, F. M. Baker, F. G. Crowell, and I. M. Gehrum of Atchison, Kan., T. Scott of Cripple Creek, Colo., and D. Scott of Gilt Edge, Mont., to operate the Mammoth group of mines and mill, near Lewistown.

LEWIS AND CLARKE COUNTY.

The Tanner G. & Gem M. Co. has been organized to operate the Pole Creek placer mines at Red Bluff, near Marysville. Spinel and sapphires are found in the gravel, and are recovered from the sluice boxes with the gold and black sand. A. W. Tanner is manager.

T. F. Stephens & Co. are developing the Indian Queen copper mine on Birch creek, near Helena. The vein is showing 20 feet wide with 7% copper and silver values. The Michigan & Montana S. & C. M. Co. has sold to Brown & Platt for \$250,000 its group of eleven quartz and two placer claims, near Alden, on the Blackfoot ceded strip. The chief values are in copper.

L. J. Clergy and D. Spogen have bought for \$2500 the Gardner Bros.' interest in six claims in Silver Camp, 22

miles west of Wolf creek, and have begun development work. The ore has to be freighted from Silver Camp to Wolf Creek, where it is loaded on cars.

Ore shipments are increasing from all districts in the central section of Montana and the East Helena smelter has blown in another furnace, says the Reporter.

The Columbia M. Co., operating the Gold Messenger, near the York, across the river from Helena, are putting in an electric hoist.

J. H. Cowan & Co. will develop and work the placers in the high bed of the Missouri river near Canyon Ferry. This channel lies 185 feet above the present river bed. The mines were worked ten years ago and produced gold and some sapphires. Water was pumped from the river to do the washing.

MADISON COUNTY.

W. W. Wishon, general superintendent of the Speculator M. Co., owning the Fourth of July group near Pony, says they have forty men at work on the Mammoth side of the hill. It is proposed to put up reduction works this spring. It is reported the Garnet M. Co.'s mill will start up by May 1st; also the Strawberry mill. Shipments are being made from the Clipper, three cars being sent out last week.

At Stirling, 3 miles below Pony, the Hennepin Ore Co. are working twenty men on the Galena mine. The new shaft is down 75 feet and a station cut and drifts started, says Superintendent Briggs. A mill is proposed.

MISSOULA COUNTY.

Superintendent Connolly of the Bitter Root Co.'s copper mine at Saltese, says a winze down 30 feet from the 200 foot level shows 10 feet of ore assaying 15% copper and \$8 gold. Forty-seven men are doing development work on the mine. Five shafts have been sunk from 150 to 250 feet, all in ore.

PARK COUNTY.

The Buffalo G. M. Co., J. A. Kennedy of Buffalo, N. Y., president, is planning the development of a number of claims near Cooke.

POWELL COUNTY.

The Eganol Placer M. Co., which owns placer ground in Lincoln gulch, near Elliston, has completed a bedrock drain 2200 feet in length. Fourteen hundred feet of the drain is an open cut and 800 feet is tunneling. The bedrock water proved so strong that pumps were necessary to keep the drifts from being flooded. The channels have proven rich, the gold found being coarse, but the expenses attached to the pumping were such as to make necessary the construction of this drain.

Machinery for the steam hoist for the Sure Thing mine at Elliston, operated by Martin & Canol of Helena, is on the ground. An upraise is being driven from the tunnel.

SILVER BOW COUNTY.

F. W. Bacorn, president of the Cable L. & M. Co., says at the Cable mine, near Butte, he is overhauling the mill for the spring and summer run. Prospecting is now being carried on by a diamond drill.

The Supreme Court has declined to grant a rehearing in the Pennsylvania mine case, but made a redvision of the mine, whereby F. A. Heinze gains 75 feet additional in the vein. This mine was in controversy between Heinze and the Amalgamated C. Co., and the Supreme Court in deciding the title divided the property equally between them. Both sides were dissatisfied with this and petitioned for a rehearing, with the above result.

NEVADA.

Eighteen new companies, with headquarters in Nevada, filed papers of incorporation with the Secretary of State during the last ten days of March.

ESMERALDA COUNTY.

At the Con. Esmeralda M. Co. group, near Hawthorne, operations will be resumed next week. A pipe line will be laid 6 miles for water. The dumps have 70,000 tons of ore extracted, which runs \$10 per ton. A body of \$25 ore has been opened up. A change in the original plans has been made; instead of putting up an engine at the mill and hauling oil for fuel, the engine will be placed at Hawthorne and power transmitted to the mines by electricity, says Superintendent Colcord.

EUREKA COUNTY.

W. C. Owens and W. F. Lineburger of Carlin report finding coal near Palisade, says the Standard.

LYON COUNTY.

The work of developing the Douglas group of copper mines, west of Yerington, is progressing, says the Lyon County Times, with twenty-five miners at work.

The tunnel from the north side has connected with the tunnel on the same level from the south side of the hill. In the upraise ore is opened up. A 2½ H. P. gasoline engine and blower have been put in at the station to furnish air in this upraise. The winze is down below the tunnel level 65 feet. Crosscuts will be run from the winze at every 50-foot level and sinking continued to 200 feet. A gasoline hoist will be placed in the station.

NYE COUNTY.

The Tonopah-Eastern G. M. Co. has incorporated at Salt Lake City, Utah, to operate a group of eight claims south of Butler. W. H. Tibbals, D. A. McDonald, E. J. Waugh and E. W. Wilson are the officers.

A. L. Hudgens has a bond on the Bennett & McCartney holdings in the Bennett group, near Butler, and has started miners at work sinking a shaft on the lead, which is the extension of the Hasbrouck-MoIntyre claims.

J. and H. Workman report a find of gold ore at a point 40 miles north of Butler. Assays of the ore show gold, with bromide, sulphide and chloride of silver.

NEW MEXICO.

GRANT COUNTY.

The Comanche M. & M. Co., composed of Michigan men, have bought the Silver City smelter at Silver City and the first payment made. The plant will be enlarged and improved. It is expected to be in operation by May 1.

OREGON.

BAKER COUNTY.

Wheeler & Co. of New York will operate the Buckhorn group, on Spokane Mt., adjoining the Blue Bird, near Sumpter, says the American. E. J. Thorpe of the Blue Bird is manager.

It is thought by the management of the South Pole Con. G. M. Co., near Sumpter, that a point in the development will be reached this summer which will warrant installing further mining and milling equipment, says Manager S. H. Bell.

Gold-bearing gravel was found last week on the dam site being excavated at the junction of McColloch and Cracker creeks, for a log pond, by the Sumpter Lumber Co., below Sumpter, says the Sumpter Miner.

Superintendent J. K. Romig, of the Sanger mine, near Baker City, says his company will put in an electric plant this season for generating power. The power house will be on Eagle creek. The cross-cut tunnel being driven to open the Fir Gulch vein is within 300 feet of completion.

The Smuggler G. M. Co. have bought the Smuggler, Black Jack, Gaynor, Red Rock and Star quartz claims, in Greenhorn district, near Sumpter.

The Kentucky group is sold to the Pacific G. M. Co. Development work in both these mines will begin this month.

The Greenhorn Mountain G. M. Co. has been incorporated by J. Fawcett, I. H. Hatfield, W. P. Killen, J. H. Humpes of Omaha, Neb., to operate in Greenhorn district, near Sumpter, says the American.

Manager A. Mohr of the St. Louis mine, near Sumpter, says work will resume this month and a 300-foot tunnel will be driven on the west side of the gulch to the west of the present workings. If this shows satisfactorily, a sinking plant will be put up. Mohr is also manager of the Wisconsin, which will resume, and a heavier pump will be put in. Sinking will follow.

T. K. Clarke of Indiana has bought the Orphan Boy group of prospects in Mormon basin, near Sumpter, for \$6500. Development will begin next week.

Bamberger & Keith of Salt Lake City, Utah, owning La Bellevue mine near Sumpter, say it will be reopened this spring. There are 7000 feet of development work done, with one tunnel in 1500 feet, and there is a Huntington mill of thirty-five tons daily capacity.

Manager R. N. Jones of the Cornucopia Mines of Oregon Co. has temporarily suspended work at the Last Chance mine in Cornucopia district, near Sumpter, it being considered too hazardous for men to pass between the Union-Companion and the Last Chance in the present state of weather, as spring thaws cause frequent and heavy slides. A change in the method of operating will be made this summer.

Manager J. N. Esselstyn of the Mountain View mine, near Baker City, says he expects to have his gasoline hoist operating by May 1st, which will be placed underground 800 feet and used for raising to the tunnel level only.

F. P. Schultz of Milwaukee, Wis., president of the Old Ahe G. M. Co., near Sumpter, says that two 80 H. P. boilers, a six-drill compressor, a hoist with 700 feet depth capacity and pumps are to be put in this month and further development work done. A mill is proposed.

The Cracker-Highland G. M. Co. has

incorporated, J. C. Davies, D. Cahill and C. L. Stickney, to develop a group east of Bourne, and near the Minneapolis group.

President Patton of the Stockton Co., near Sumpter, says they will sink to a depth of 700 feet, being down 220 feet. A hoist is already up, but they intend to put in a compressor plant and heavier pumps.

The Bonanza main compartment shaft, near Sumpter, is down 1000 feet, being the lowest depth reached in the camp. A station has been cut for a pump. Ore is being stoped on the 800-foot level for milling. Thirty of the forty stamps are dropping.

DOUGLAS COUNTY.

After a suspension of several months, operations at the Myrtle Creek oil well, near Myrtle creek, are to be resumed by the Umpqua Valley Oil Co. of Roseburg, says the Roseburg Review.

GRANT COUNTY.

Manager Hughes of the Equity Co. says he is putting in a concentrator for their 5-stamp mill near Quartzburg.

The New Year's Gift mine, near Quartzburg, has been sold to J. Reese.

Work will be resumed this spring on the Gladstone group, near Alamo, owned by the Interstate G. M. Co., W. H. Meade of Spokane, Wash., manager. There are five claims, and a tunnel is driven on the ledge.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Manager W. L. McLaughlin of the Horseshoe M. Co., near Deadwood, says operations have resumed in the mine and that the mill will be completed.

There are 20 feet of ore exposed on the Card & Rosenkranz ground at the head of Falsebottom creek, near Deadwood, in a drift from the bottom of a shaft 100 feet deep, and assays show an average of \$4.21. Six feet of the ore is said to be phonolitic. The slates next to the ore are also mineralized, and give assays of \$4. This ground is being worked under bond and lease by E. P. Farnham of Central City, representing Chicago men.

The monthly report of the Spearfish M. & R. Co., near Deadwood, shows for March 6100 tons of ore mined and treated at the mill, the capacity being 200 tons per day. The value of the ore averaged \$5 per ton and a net profit of \$2.50 per ton is made above the expenses of mining and milling.

PENNINGTON COUNTY.

(Special Correspondence)—The Bullion gold mine at Keystone is sold to F. H. Long, a mining engineer of Chicago, who, with his associates, will place the property upon a working basis. Ore has been blocked out to furnish a mill of 300 tons daily capacity. It is contemplated to erect a 300-ton plant. The ore averages nearly \$7 per ton. About 50% is free milling. Stamps and plates will be used, together with a concentrating plant and cyanide annex. The main vein is 40 feet wide.

Keystone, April 4.

The Lakotah M. Co. of Peoria, Ill., men, owning the Grizzly Bear mine, near Keystone, will increase development work this summer. The mill will be replaced by a more modern plant on the same site and an aerial tramway put up. Development work has been under way in the mine during the past winter.

TEXAS.

EL PASO COUNTY.

The Federal smelter at El Paso is reported to have resumed. The company owns a group of mines at Terrazas, in Chihuahua, Mexico.

Reports from El Paso smelter, at El Paso, say that due to the increased tonnage of Mexican ores coming in, another copper furnace has been blown in. Five furnaces are running, but coke is scarce.

MENARD COUNTY.

J. R. Stone reports uncovering gold ore a few miles from Menardville.

UTAH.

BEAVER COUNTY.

Manager F. Morehouse of the Erle C. M. Co., near Milford, says a 22 H. P. gasoline hoist will be put up. The main working shaft is down 200 feet.

Manager Crowther of the Blue Acre mine, at Blue Acre, says last week a 3-foot excavation for a cellar exposed a vein of copper ore. Sinking was continued, and at 12 feet the bottom is all in ore, associated with iron and quartz. No. 1 shaft is down 185 feet and going down at the rate of 2 feet per day. It is in ore with several inches of sulphide that carry 20% copper. The vein will be crosscut on the 200.

S. Osborne, superintendent of the O. K. mine of the Majestic M. Co., near Milford, last week put in a 34 H. P. gasoline hoist

at the Old Hickory and one at the O. K., making a total of five gasoline hoists on the Majestic group. The 12 H. P. hoist formerly on the Old Hickory will be removed to the Gomer shaft of the Harrington-Hickory.

J. W. Taylor of the Hub M. Co. says development work will be begun next week on the group of nine claims in South Star district, near Milford. It is the intention to send the 60-foot shaft down to 600 feet. The Hub adjoins the Burning Moscow and Big Gentile.

CARBON COUNTY.

Small oil flows are reported struck in the wax claim shafts near Colton.—Cafey, Ranschoff, Moritz et al. propose putting in an oil rig in Argyle canyon this summer.—Manager Ketchum of the Grand View Co. says he will resume work near Sunnyside next week.—McWhorter & Hastings are waiting for the snow to melt, to resume above Sunnyside.

—The Price Oil Co. will put up a drilling rig on their ground near Sunnyside, says Manager M. Sommers.

Manager Ketchum of the Grand View Oil Co., whose well is near Sunnyside, states he will open operations this month.

IRON COUNTY.

At the Johnny mill at Stateline the cyanide plant was put in operation last week, treating the tailings.

B. F. Thornburg of Salt Lake City has a lease and bond on a group of claims at Kanarraville for \$5000.

JUAB COUNTY.

A total of 452 cars of ore were shipped from the mines of Tintic district, around Eureka, during March, the principal shippers being: Centennial-Eureka 106 cars, Dragon iron mine 73, Grand Central 81, Gemini 50, Mammoth 47, Yankee Con. 28.

Manager C. E. Allen of the Centennial-Eureka mine, at Eureka, says sinking of the main shaft has been temporarily suspended, due to the drainage of an excess of surface waters down onto the men at work.

PIUTE COUNTY.

(Special Correspondence).—The Overlooked property is reported improving. The quartz is different from any other in the district and is yellow, with dark purple streaks and spots, with iron oxide that is rich. Five inches of the vein shows gold. R. DeWitt has opened an extension of this property, which shows well.

M. Hennessy of Horse Heaven reports a fine showing of ore in the Bodle.

Packard Bros. are at work on their property in Bullion canyon.

W. Hehl, owner of the Midnight Sun, is developing a body of gold ore.

The Gold Queen, on Deer creek, gave returns of \$10 in gold across an 8-foot ledge.

The extension of the Denver & Rio Grande Railway from Marysvale to a point 90 miles south is expected, as contracts have been let for the work. It is expected to tap the Santa Fe and a branch of the Clark road at Cedar City.

Marysvale, April 5.

SALT LAKE COUNTY.

The Salt Lake Tribune says the bullion output of the valley furnaces during the month of March amounted to \$2,784,479, inclusive of that produced at the independent smelters. This is a slight shrinkage, attributable entirely to the breaking up of the roads between the diggings and the loading stations along the lines of railway. The output of copper bullion during the same period shows the independent smelters forwarding to Eastern refineries 2,849,797 pounds, valued at \$750,000, while the two copper furnaces operated by the American S. & R. Co. produced 1,329,000 pounds, which, in addition to copper, gold and silver, contained a few units of lead. The March record was as follows:

	Pounds.
American.....	1,329,000
Bingham Con.....	727,190
Highland Boy.....	1,268,400
United States.....	854,207

Total.....4,178,797

In the open market the ore and bullion settlements for the month reached a total of \$2,029,540, as compared with \$1,410,190 for the corresponding period of 1902, and with \$2,039,500 for February.

The Gold Flusure M. Co. of Salt Lake City has incorporated; A. J. Weber, J. F. Gihhs, M. P. Baffet. The company owns eight claims in the Henry district, Sevier county, and three claims in Gold Mountain district, Piute county.

Work has been partly resumed in the Dalton & Lark tunnel, near Bingham, which recently struck a 2000-gallons-a-minute flow of water that drove the men out.

SUMMIT COUNTY.

H. C. Brownlee, superintendent of the

St. Louis-Ontario M. Co. at Park City, says machinery will be installed.

Manager S. Levy of the California mine at Park City says a steam plant is being put in to hasten sinking the shaft to the tunnel level.

For March, at the properties of the Daly-West M. Co., at Park City, the output was 7000 tons of ore and concentrates, for which it received approximately \$200,000. E. Bamberger, assistant manager, says the forwarding of ore from the Quincy shaft has resumed.

A two-third interest in the St. Lawrence group in the Utah mining district, near Park City, has been sold to the Nail-driver M. E. & M. Co.

Manager R. G. Wilson of the New York mine, Park City, says the hoisting plant is in operation and sinking will resume.

WASHINGTON.

FERRY COUNTY.

Manager C. O. Barnes says he has contracted with the smelter to ship ore from the Trade Dollar mine, near Republic—freight and smelter charges \$5.70 per ton. The entire ore dump will be shipped and stoping will be started.

OKANOGAN COUNTY.

J. P. Blaine, resident manager of the Opal M. Co., at Chesusaw, says more men will be put on at the Opal, and work will be started on the Ben Harrison, adjoining, owned by the same company. A reduction plant will be put up.

SNOHOMISH COUNTY.

The Bell & Crown mine resumed operations last week, says Manager Johnson. The mine is 3 miles from Silverton, on the south side of Marble mountain.

STEVENS COUNTY.

The Northport News says the Northport smelter of Le Roi Co. has four furnaces in operation and the fifth will be blown in next week. Every train arriving from the south is bringing in ten to fifteen cars of coke, and a supply has been arranged for with Eastern companies.

The McIntyre mine, in Black canyon, on Deep creek, near Northport, has resumed. There is a 260 foot tunnel on the claim, and this will be driven ahead, expecting to cut the vein with 40 feet more. There are two ledges of 14 and 30 feet in width on the surface, showing values from \$7 to \$28 in silver and lead.

WHATCOM COUNTY.

The Mount Baker-Yale M. Co. will put up an 80-stamp mill on their group, near Whatcom, instead of forty stamps, as at first proposed.

WYOMING.

ALBANY COUNTY.

The derricks for the Laramie Oil & Gas Co. are being placed at a point 12 miles up the Big Laramie from Laramie, and drilling will begin next week. The company expects to strike oil or gas at a depth of 1500 feet.

CONVERSE COUNTY.

Superintendent Phillips is erecting additional buildings at the oil wells, near Douglas.

Manager E. J. Wells will put in additional machinery at the Orville mine in the War Bonnett copper district, near Douglas.

UINTA COUNTY.

Oil is reported struck at the Craig well, near Spring valley, owned by the Carter estate.

FOREIGN.

BRITISH COLUMBIA.

At the Le Roi mine, Rossland, the ore shoot has been opened up on the 1050-foot level. The smelter has blown in three furnaces.

At Le Roi No. 2, in the Josie and No. 1 mines, undercutting the ore bodies in the lower levels is being carried ahead. The surveys of the millsite are finished.

The Marble Bay mine at Texada has begun ore shipments. The total output of the mine—100 tons daily—will be sent out.

H. M. Stevenson, manager of the Highlander mine at Ainsworth, says that, owing to the rise in price of lead, his company will start operations this month.

Last week the branch pole line from Cascade sub-station in Phoenix to the Snowshoe mine was completed and an electric hoist and transformers are being put in place. Ore bins of 150 tons capacity are being built at the hoist.

The coal miners' troubles on Vancouver island are extending to Cumberland. When the 1000 or more miners employed at the Extension mines voted to join the Western Federation, J. Dunsmuir, the owner, closed the mines. A branch has been organized at the Union mines at

Cumberland. There are 500 men employed there. If these men join the federation the mines will be closed down, as have those at Ladysmith, says Dunsmuir.

R. Fraser, as agent for G. T. Henderson of Canton, S. D., has posted notice for 7000 inches of water at Bull river falls; also eighty acres of placer ground, near Fort Steele, says the Prospector. The water will be used for motive power to generate electricity to be supplied to the towns and mines of the district.

KLONDIKE.

Dawson reports say rich pay has been struck on Bear creek. On 14 below \$6 to the pan at 6 feet in bedrock was found. The richest pay on Gold Bottom creek was found on 11 below, where \$14 to the pan was taken out. The railroad between the Yukon river and the coal mines, on Coal creek, will be completed and in operation by August 1. The Chute and Willis group on Gold Run has been transferred to the Gold Run syndicate of Paris for \$1,500,000. A. McDonald has sold ten claims on Chebacco hill to the Chebacco Hill M. Co. of New York for \$30,000, says Manager Holland.

MEXICO.

CHIHUAHUA.

The Chihuahua Enterprise says a 100-ton concentrating plant will be built 5 miles from Minaca, also a narrow-gauge railroad from that place to the plants and mines, by the Calera M. Co. Development work has opened up holes of ore carrying values in zinc, lead and silver.

The Chihuahua M. Co. at Santa Eulalia are putting in another engine and expect to increase shipments to 700 tons of ore daily.

The Candelaria M. Co., D. B. Smith superintendent, is doing considerable development work at its mines at San Pedro. A double-compartment shaft is down 330 feet and will be sunk 1000 feet.

The water has been brought under control in the Prieto mine, near Parral, and operations will resume next week.

GUERRERO.

The Mitchell M. & S. Co., G. Mitchell of Los Angeles, Cal., president, has made a survey from the company's mines for a railroad to Acapulco. Additional machinery will be put in at the mine.

SONORA.

Boyce & Conkling have started work on the La Cahriza mine, near Sahuaripa. J. Burke is superintendent. The mine is 100 miles from Minaca, and shows values in gold, copper and silver. There is a shaft down 60 feet, and if the ore body continues it is planned to build a smelter. Tinber is abundant.

M. Mendenhall, metallurgist of the Nogales C. Co., says a 300-ton cyanide plant will be erected at the Cerro Prieto gold mines at Cerro Prieto, owned by the company. F. N. Cox is superintendent of the mines.

J. C. Underwood, manager of the Yerkes M. Co., at Yerkes Camp in Altar district, says the 20-stamp mill and the cyanide plant are in operation.

J. W. Gates & Co. are reported to have bought the Creston and Colorado mines, 15 miles east of Torres, on the Sonora Railway, for \$10,000,000.

Books Received.

The Statistician and Economist for March, 1903, is fully up to the valuable compilation of statistics published for so many years by the veteran statistician, L. P. McCarty, 929 O'Farrell street, San Francisco, Cal.; price 25 cents.

"Notes on Metallurgical Analysis," by N. W. Lord, professor of metallurgy and mineralogy at the Ohio State University, is a book intended as a text book for students in metallurgical chemistry. It gives in a condensed form a series of selected methods and descriptions of metallurgical processes. Sixteen illustrations, 228 pages. Price, \$2.50, postage prepaid. Ohio State University, Columbus, Ohio.

"Railroad Construction, Its Theory and Practice," is the title of a newly revised edition on this subject, by Walter Loring Webb, C. E. It deals with every phase of railroad construction, including excavation, rock blasting, tunneling, etc., as well as trestles, bridges, etc.; and also has an interesting chapter on the block system. The work contains 672 + XVII pages, and 232 figures, including halftones. The principal feature of the new edition of this well-known book is in its volume which has been reduced to pocket size, 4 1/2 x 7 inches. Bound in flexible morocco. Price, \$3. John Wiley & Sons, New York and London.

PERSONAL.

J. A. FLINT, of Butler, Nev., is in Montana on mining business.

S. LEVY is manager of the California mine at Park City, Utah.

P. FLYNN of Denver, Colo., is in Idaho, examining mining property.

A. SUTHERLAND is assayer at the Victor mine at Robinson, Utah.

HENRY BUTTERS has returned to San Francisco, Cal., from Europe.

J. F. SHELTON of Sumpter, Or., has gone East on mining business.

J. B. WORD, M. E., of San Francisco, Cal., has gone to Denver, Colo.

P. WOODS of Folsom, Cal., is in San Francisco, Cal., on mining business.

W. OCHS, of Salt Lake City, Utah, is in Eureka, Nev., on mining business.

W. L. McLAUGHLIN is manager of the Horseshoe M. Co., near Deadwood, S. D.

F. BETTLES of Salt Lake City, Utah, is at the Revenue mines and mill at Norris, Mont.

J. F. BECK, who is interested in mining properties at Butte, Mont., is in San Francisco, Cal.

MANAGER W. J. DOOLY of the Johnny mine at Stateline, Utah, is in Salt Lake City, Utah.

R. L. HAMMOND of Iron Mountain, Mich., is in Salt Lake City, Utah, on mining business.

F. MOREHOUSE of Salt Lake City, Utah, is examining mining property near Mendota, Idaho.

MANAGER ATWATER of the Ymir mine at Ymir, B. C., returned from Spokane, Wash., last week.

J. P. BLAINE, resident manager of the Opal M. Co., has returned to Chesaw, Wash., from Ohio.

FORMER SUPERINTENDENT BROUGHAL of the Daly-Judge mill at Park City, Utah, has resigned.

MANAGER C. E. KNOX of the Montana-Tonopah M. Co., is at Butte, Nev., from Salt Lake City, Utah.

GEO. L. WALKER is general sales agent Pacific Steel & Wire Co., 100 Front street, San Francisco, Cal.

MANAGER C. N. THOMAS of the Nogales Copper Co. at Cerro Prieto, Sonora, Mexico, is in Chicago, Ill.

S. F. HUNT returned last week to Salt Lake City, Utah, from an examination of mining property in Idaho.

C. MITCHELL is in charge of the laboratory at the Black Diamond mine and smelter, near Bisbee, Ariz.

J. DERN, of Salt Lake City, Utah, president of the Con. Mercur M. Co., is in Fremont, Neb., for a brief visit.

P. J. DONOHUE of the Western Exploration Co. returned to Salt Lake City, Utah, last week from Canada.

B. CRILLY has resigned as superintendent of the Nettie L. mine at Loomis, Wash., and is in San Francisco, Cal.

E. S. GILES is manager of the Centurion M. Co., operating on Donaldson mountain, near Idaho Springs, Colo.

E. W. BADGER of Amboy, Ill., returned last week from an examination of mining property in Yavapai county, Arizona.

PRESIDENT D. H. PEERY of the Salt Lake City, Utah, Mining Exchange, has returned from a trip to Honolulu, H. I.

W. F. SNYDER of Salt Lake City, Utah, manager of the Western Exploration Co., has gone to California on mining business.

C. D. LANE, owning mining interests in Alaska, has returned to San Francisco, Cal., from Nome and Ketchikan, Alaska.

O. W. KESTER of Park City, Utah, is superintendent of the Latham mine at Spruce, in Spruce Mountain district, Nev.

D. McVICHIE, manager of the Bingham Con. M. Co., returned last week to Salt Lake City, Utah, from Boston, Mass.

W. McCORNICKE of the Siberian Exploration Co. left Salt Lake City, Utah, last week for the company's mines in Siberia.

H. C. BROWNLEE, superintendent of the St. Louis-Ontario M. Co., returned to Park City, Utah, from St. Louis, Mo.

G. W. SCOTT, superintendent of the Black Oak mine, near Soulsburyville, Tuolumne county, Cal., is in San Francisco, Cal.

M. MENDENHALL is superintendent of

the cyanide plant to be erected by the Nogales C. Co. at Cerro Prieto, Sonora, Mexico.

J. ROSS JR., superintendent of the Wildman-Mahoney mine, at Sutter Creek, Amador county, Cal., is in San Francisco, Cal.

W. GRAVES of Salt Lake City, Utah, has gone to Nicaragua, C. A., as superintendent of a gold reduction mill near Bluefields.

FRANK GRIFFIN, general manager Western Engineering & Construction Co., has returned to San Francisco from Santa Barbara, Cal.

A. G. DE CHAMPS, former manager of the Portland G. M. & M. Co. at Cripple Creek, Colo., is examining mines in Sonora, Mexico.

SYDNEY REEVES, who has had charge of the Echo Co.'s 10-stamp mill, 5 miles west of Mojave, Kern county, Cal., is in San Francisco, Cal.

O. STALMANN, manager of the Glasgow & Western Exploration Co., has returned to Salt Lake City, Utah, from their Nevada camps.

M. SOMMER, vice-president of the St. Louis-Ontario M. Co. at Park City, Utah, returned last week from a directors' meeting at St. Louis, Mo.

H. M. STEVENSON, manager of the Highlander mine at Ainsworth, B. C., returned last week from an extended visit to New York and Philadelphia.

C. E. PALMER of Colorado Springs, Colo., is superintending engineer of operations for the Guggenheim Exploration Co., with offices in Denver, Colo.

H. A. COHEN of Salt Lake City, Utah, manager of the Bully Hill group of mines and smelter at Winthrop (De Lamar), Shasta county, Cal., is at the mine.

E. E. NOON, superintendent of the Santa Rosalia mine and mill, near Arizpe, Sonora, Mexico, is examining mining property near Acapulco, Guerrero, Mexico.

M. E. HILON of Deadwood, S. D., former manager of the Columbus plant, is instructor in chemistry and assaying, Nebraska State University, at Lincoln, Neb.

W. LARSON, vice-president, and W. M. Thomas, secretary, of the Nogales Copper Co., returned last week to Chicago, from their mines at Cerro Prieto, Sonora, Mexico.

G. F. HOFFMAN, E. M., of San Francisco, Cal., has gone to Siberia, via Nome, in the interest of the Guggenheim Exploration Co. He is accompanied by his son, J. D. Hoffman.

O. C. ZINNS, who for several months past has been chemist at the reduction works of the Penn Chemical Co. at Campo Seco, Cal., has resigned, and is in San Francisco, Cal.

J. M. COX, for seven years foreman of the Mokelumne and Campo Seco Canal & M. Co., near Mokelumne Hill, Cal., has resigned and gone to San Francisco, Cal. M. B. Lillie succeeds him.

PERCY S. DAVIS, one of the directors of the Davis Calyx Drill Co., has returned from a prolonged business trip in Australia. On the way back Mr. Davis stopped at Sonora, Mexico; Virginia City, Nevada, and a number of other localities where the Davis drills are in operation.

H. NOYES and H. R. SKINNER, commissioners appointed by the British Government from Johannesburg, S. A., to investigate labor in China with a view to obtaining laborers to supply the demand in the mines of the Rand, are in San Francisco, Cal. While in California they will inquire into Chinese labor on the Pacific coast.

FRANK H. PROBERT of the firm of McLean & Probert, consulting mining engineers of Los Angeles, Cal., has been appointed consulting engineer to the W. B. Thompson Co. of 10 Postoffice Square, Boston, Mass., who are operating the Shannon Copper Co. and the Coronado Mining Co. at (ifton, Ariz. Mr. Probert will devote the greater part of his time to the company's interests in Arizona.

JOHN RYAN, superintendent of the works of the Pacific Coast Borax Co., in Death Valley, Cal., is reported to have been assassinated by Indians 9 miles from the company's camp at Borate, in Inyo county, Cal. The only reason assumed for the murder is the fact that the Indians of that vicinity guard the limited

water supply of the region jealously, and as Mr. Ryan was in search of water with the company's tank wagon, accompanied by a teamster, who was also killed, the Indians probably shot them.

J. C. RUSSELL, a retired pioneer miner and business man of California and Colorado, died on the 2nd inst at his home in White Plains, N. Y. Deceased was born May 16, 1829, in New Hampshire, and leaves a daughter and three sons, one of whom—F. M. Russell—is a mine owner of Wallace, Idaho.

R. BANE, a pioneer miner of Shasta county, Cal., died at Newtown, El Dorado county, Cal., April 1st at the age of 74 years.

Commercial Paragraphs.

THE Western Engineering & Construction Co. has moved its offices from the Safe Deposit Bldg. to 408-414 Rialto Bldg., San Francisco, Cal.

THE Pacific Steel & Wire Co., Frank L. Brown general manager, have opened offices and salesrooms at 100 Front street, San Francisco, Cal.

F. W. BRAUN & Co. of San Francisco and Los Angeles, Cal., report arrangements made by which they become the sole selling agents in Australia and New Zealand for Wm. Ainsworth & Sons' balances.

HENSHAW, BULKLEY & Co., of San Francisco, Cal., report shipping this week a Kinkadee mill to the Keystone mine, at Amador City, Amador Co., Cal. Competitive tests are to be made between this mill and a 5-stamp battery.

STRATTON'S INDEPENDENCE, LTD., MINE, Victor, Colo., has put in a Jeanesville Iron Works' compound condensing pump, capacity 1000 gallons per minute, on their 1400 foot level—the deepest pumping plant in the State.

H. A. LEE, Colorado's Commissioner of Mines, and J. W. Finch, the Colorado State Geologist, have formed the partnership of Lee & Finch, Equitable Bldg., Denver, Colo., for practice in mining engineering and economic geology.

HENRY ENGELS has been appointed Pacific coast agent of the Chicago Pneumatic Tool Co. Mr. Engels will have his headquarters with Eccles & Smith, 91 Fremont street, San Francisco, Cal., the latter gentlemen continuing as general agents of the company.

THE American Steam Gauge & Valve Mfg. Co., Boston, Mass., the well-known manufacturers of gauges, valves, indicators, etc., has recently been incorporated under the laws of New Jersey with a capital of \$250,000. The company will have completed, for occupancy in the early fall, a new factory building, where their present output can be doubled.

THE Risdon Iron Works of San Francisco, Cal., report having a contract for the construction of 4,000,000 pounds of steel pipe for the water-power plant being built on the Puyallup river, near Tacoma, Wash., by the Pierce County Improvement Co. At its head the pipe line will be 48 inches in diameter, being gradually reduced to 36 inches at the bottom. The first section will be 1700 feet long and have a drop of 877 feet. An order has also been received this week by the Risdon Iron Works for a 10-stamp mill from the North American M. & M. Co. at Barron, Wash.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

COMPENSATING HEELS FOR BOOTS OR SHOES.—No. 724,150. March 31, 1903. Robert Wynell, San Francisco, Cal. This invention relates to an attachment for boot and shoe heels which is designed to compensate for the wear which ordinarily takes place upon these parts and to keep them constantly in proper shape for walking. It consists of a flanged cup fitting a hole made in the heel of the shoe and preferably nearer to the side upon which the wear takes place. Within this cup is fitted the wear-piece, which projects slightly so as to receive the impact of walking, and this wear-piece may be extended as fast as it is worn away by the use of interior filling pieces or washers, which rest upon the interior bottom of the cup.

MACHINE FOR MAKING TUBULAR SHELLS.—No. 724,104. March 31, 1903. C. E. Ingals and A. V. Jackson, West Berkeley, Cal. This invention relates to improvements in paper shell making machines, and its object is to provide an automatic machine for making tubular shells designed particularly for use with dynamite cartridges. It consists in a machine, the combination of a containing receptacle for blanks; a vertically movable follower thereon; means including a lever whereby the follower is given an intermittent movement; a horizontally reciprocating foot-piece, and link connections between said foot-piece and lever whereby the follower and foot-

piece are operated in unison: feed rollers by which the sheet is advanced; and stop means whereby the feed rollers and foot-piece are adapted to project into the path of said sheet to check its movement thereon during the forward movement of the foot-piece. There are also means of construction by which holes of any desired size may be made; and so the manufacturer's name may be imprinted upon the shell as the form-roller is advanced, and in operation on the timing of the various movable parts is so regulated that the several movements are co-ordinated to achieve the results contemplated.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING MARCH 31, 1903

724,237.—PAPER FILE.—L. W. Armstrong, Walla Walla, Wash.

724,846.—FALL ROPE CARRIER.—M. Bradford, Los Angeles, Cal.

724,325.—JAW CLOSURE.—W. E. Brown, Los Angeles, Cal.

73,084.—STOVEPIPE FASTENER.—F. H. Busby, S. F.

718,838.—LOCK AND ESCUTCHEON.—W. Chalmers, S. F.

723,958.—WINDMILL.—O. Church, S. F.

724,161.—DRILL.—Clark & Currie, S. F.

724,405.—WINDOW WASHING SCAFFOLD.—J. C. Brown, Los Angeles, Cal.

714,266.—FRUIT WRAPPER.—E. Duvanes, Sierra Madre, Cal.

721,384.—ANCHOR.—C. E. Fowler, Seattle, Wash.

724,408.—PORTABLE HOUSE.—J. D. Horton, Seattle, Wash.

721,101.—TENTRAL SHELL MACHINE.—Ingals & Jackson, Berkeley, Cal.

724,409.—CASH REGISTER.—P. Lalo, S. F.

724,024.—HOLDER FOR TRAIN ORDERS.—C. A. Luck, Berkeley, Cal.

724,191.—TRIAL FRAME.—S. G. Marshutz, Los Angeles, Cal.

724,327.—GUN ATTACHMENT.—R. M. G. Phillips, Los Angeles, Cal.

724,309.—JAW CAP TOOL.—J. G. Rosenberg, Seattle, Wash.

724,053.—OIL BURNER.—R. F. Schroeder, Sacramento, Cal.

724,341.—POWER TRANSMITTER.—F. Sedivy, Globe, Ariz.

724,316.—JOINT SUPPORT.—R. Staeton, Portland, Or.

724,362.—TWIN HOLDER.—J. A. Thompson, Seattle, Wash.

724,362.—FISH NO. GEAR.—A. W. Wilson, S. F.

724,150.—HEEL FOR BOOTS AND SHOES.—R. Wynell, S. F.

Latest Market Reports.

SAN FRANCISCO, April 10, 1903.

METALS.

SILVER.—Per oz., Troy: London, 22½d (standard ounce, 925 fine); New York, bar silver 49½; refined (1000 fine); San Francisco, 49½; Mexican dollars, 38 @ 39c San Francisco, 38½c New York.

COPPER.—New York: Standard, \$13.75; Lake, 1 to 3 casks, \$14.50; Electrolytic, 1 to 3 casks, \$14.50; Casting, 1 to 3 casks, \$14.25; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £60 10s spot per ton.

Copper the past week has shown a slightly lower tendency, though the demand seems to have been little decreased. The best grades of Lake copper are in large demand for electrical purposes. Fluctuations of copper stocks in the stock markets do not affect the trading in the metal apparently. The statement is made in Boston that Lake mines operated by the Amalgamated Association have worked at a loss, while independent mines in the same district have made money for their owners the past year, as determined by the reports of the several companies.

LEAD.—New York, \$4.67½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$1.75. London: £13 13s 9d per long ton = 2.75c per lb.

SPELTER.—New York, \$5.65; St. Louis, \$4.60; London, £23 5s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 100-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$30.00@30.05; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33c; bar tin, \$35 @37½c. London, £138 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots: London, £8 15s; San Francisco, local, \$45.00 @ flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17 15c.

NICKEL.—New York, 50@60c @ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.35; gray forge, \$20.50; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg,

Obituary.

JOHN RYAN, superintendent of the works of the Pacific Coast Borax Co., in Death Valley, Cal., is reported to have been assassinated by Indians 9 miles from the company's camp at Borate, in Inyo county, Cal. The only reason assumed for the murder is the fact that the Indians of that vicinity guard the limited

\$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; 1x4, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15¢; less than one ton, 17¢. No. 1*, 60%, carload lots, 13¢; less than one ton, 15¢. No. 1** 50%, carload lots, 11¢; less than one ton, 13¢. No. 2, 40%, carload lots, 10¢; less than one ton, 12¢. No. 2*, 35%, carload lots, 9¢; less than one ton, 11¢. No. 2** 30% carload lots, 9¢; less than one ton, 11¢. Black blasting powder in carload lots, minimum car 725 kgs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s. 10½¢ per set; 14 oz., 40s., 9½¢.

CEMENT.—Germania, \$2.50 @ 2 75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2 75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$3.00; Seattle, \$6.50. Coos Bay, \$5.50; Southfield, \$3.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$3; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56¢; cs., 61¢; raw, bbl., 54¢; cs., 59¢; Lucol oil, boiled, bbl., 50¢; cs., 55¢; raw, bbl., 48¢; cs., 53¢. Kerosene—Pearl, per gal., 22½¢; Astral, 22½¢; Star, 22½¢; Extra Star, 25½¢; Eocene, 24¢; Elaine, 27½¢; Water White, in bulk, 16¢; Mineral Seal, iron bbls, 18½¢; wooden bbls., 21¢; cs., 24¢; Mineral Spermin, cs., 26½¢; Deodorized Stove Gasoline, bulk, 17¢; do., cs., 23½¢; 86° Gasoline, bulk, 21¢; do., cs., 27½¢; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16¢; do., in cs., 22½¢; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75¢; cs., 80¢; Spermin, crude, 50¢@60¢; Natural White, 65¢; Bleached do, 70¢; Whale Oil, cs, 50¢@55¢.

CHEMICALS.—Cyanide of potassium, 98%—99%, jobbing, 25¢@26¢ per lb.; carloads, 24¢@24½¢; in tins, 35¢; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 28¢@30¢ per lb.; caustic soda, in drums, 3¢@4¢ per lb.; Cal. s. soda, bbls., \$1.25@1.50 per 100 lbs.; sks., \$1.05; chlorate of potash, 12¢@13¢; nitrate of potash, bbls., 8¢; caustic potash 10¢ in 40-lb tins; borax concentrated, 7¢@8¢ per lb.; roll sulphur, 4¢@6¢; powdered sulphur, 2¢@3¢; flour sulphur, French, 2¢@3¢; alum, \$2.00@2.25; California refined, 2¢@2½¢ sulphide of iron, 9¢ per lb.; copper sulphate, 5¢@7¢; chloride of lime, spot, \$3.00@4.00 sulphuric acid, in carboys, 66¢ B, 2½¢ per lb.; nitric acid, in carboys, 8¢ per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., per lb., 6½¢; in 25-lb. tin pails, ½¢ per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ½¢ per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6¢; do. in kegs, 6½¢.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., 6½¢.

LITHARGE.—Pure, in 25-lb. bags, 8¢@9¢ per lb.

BONE ASH.—Extra No. 1, 5¢@6¢ per lb. No. 1, 4¢@5¢.

BORAX.—Concentrated, 7¢@9¢ per lb. powdered, 9¢@12¢; fused, 25¢@30¢.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4¢ per lb.

BORAX.—Crystal, 7¢; calcined, 25¢.

COPPER.—Sulphate, 5¢@7¢.

MANGANESE.—Pure, ½ lb., 60¢.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

SODIUM.—Metal, ½ lb., \$1.00.

MERCURY.—Bichloride, ½ lb., 90¢.

PHOSPHORUS.—(American) ½ lb., 75¢.

SILVER.—Chloride, ½ oz., 90¢@1.00; nitrate, 55¢.

URANIUM.—Oxide, ½ lb., \$3.50.

ZINC.—Metallic, chemically pure, ½ lb., 50¢; dust, ½ lb., 10¢; sulphate, ½ lb., .04¢.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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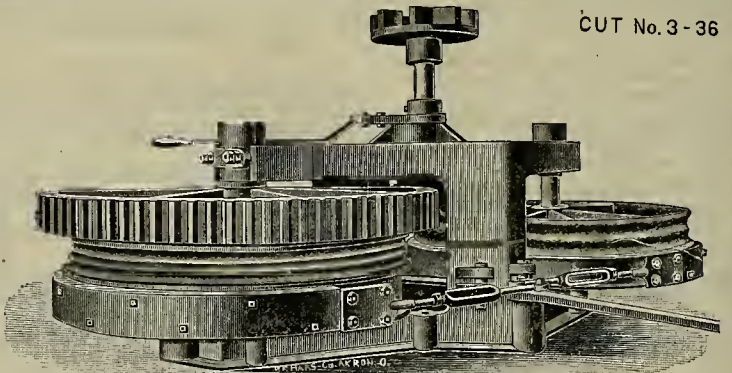
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MINING AND SCIENTIFIC PRESS

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The Gambetta Mine.

In Madera county, Cal., at Gruh Gulch, is located the Gambetta mine, which in some respects is unlike the average California gold mine. The formation is mica schist and mica slate, which, with other metamorphics, are the principal rock of the district, though in the immediate vicinity is a granite mass which has a width of about 14 miles, extending westward to the low foothills bordering the plains of the San Joaquin valley. The vein is a fissure, in which respect it differs somewhat from most of the other mines of the district, they, with the exception of the Bullion vein— $\frac{1}{2}$ a mile distant, which is also a fissure—and the Josephine vein, a contact fissure, being lens-like quartz masses which usually conform closely with the strike and dip of the country rock.

The Gambetta has been developed to a depth of 860 feet and is still sinking. Levels are open at 400, 600, 700 and 800 feet. This mine affords an illustration of the vagaries and uncertainties of the trend of ore shoots. The ore shoot discovered on the surface was stoped out down to 600 feet, and its lower edge had a low dip, less than 35°, to the eastward, crossing the main shaft, sunk on the vein, and passing over 100 feet to the eastward of it, so that the shaft, though still following the fissure, exposed no ore from about the 600 to below the 800 level, but about the 600 level the shoot assumed a vertical position and then turned westward, while its upper limb still trends eastward as far, at least, as the 800, on which level the shoot is 650 feet long. The ore has come into the shaft and has crossed again to the west side.

The fissure is about 30 inches wide with a pay-streak varying from 4 inches to 2 feet. The quartz carries about 4% sulphides of iron with copper, lead and zinc sulphides in smaller amount. In the massive iron sulphides it is not uncommon to find coarse gold.

The mill and hoist buildings are built over the main shaft. The accompanying engraving is an illustration of the mill. The surface equipment consists of one 45 and one 60 H. P. hoiler, steam hoist and Huntington 5-foot mill with two 6-foot Frue vanners. Oil is used for fuel. Amalgamation is practiced in the mill and on outside plates. The tailings assay about \$2 per ton. The concentrates are worth \$180 per ton and are shipped.

A short distance south of the Gambetta is the Josephine vein, which strikes toward the former, and if the respective direction of the strike of the veins is maintained they should meet about 1000 feet west of the Gambetta shaft. The Josephine occurs at con-



The Gambetta Mine, Madera Co., Cal.

tact of granite and slate and has been worked extensively to a depth of about 600 feet. It was formerly equipped with steam hoist, 20-stamp mill and chlorination works, but the mine was dismantled about 1890 and has since been idle. It is owned by the Gambetta Co. It is thought that some interesting developments may be made when the union of the Gambetta and Josephine veins is reached.

Cost of Mine Timbering.

The timbers comprising "one set" in the square set system consist essentially of eight pieces, viz., four posts, two caps and two ties. Where the system is extensive—that is, where set follows set horizontally and vertically—then the two posts on any side form a side of the adjoining set. In proceeding upward the caps and ties are not similarly counted. In certain modifications of the square set system, which have been introduced in some regions where round timbers are used almost exclusively, two timbers are sometimes employed in place of the tie of the regulation square timber set, these two then being called "sprags." In this case the set would consist of four posts, two caps and four sprags, making ten timbers instead of eight. Where sills are used it is unnecessary to consider them as constituting a portion of a regular set. Where angle braces are regularly inserted in each set, this would

add two timbers to the set. As a matter of course, along the walls of the vein the posts may or may not come in close proximity to the walls. In any event, butt caps or sprags are placed, reaching to the wall, to render the whole structure rigid, but these are not considered as constituting a portion of a regular set. Each lot of timbers inclosing the rectangular space included by them is considered a set, but it does not follow that, because there are twenty-four such spaces so included in a stope, there are twenty-four times eight timbers in the several sets. In a stope containing four sets wide across the vein and six sets along the vein, there are on the sill floor thirty-five posts, twenty-eight caps and thirty ties—a total of ninety-three timbers, or an average of $3\frac{1}{2}$ timbers per set. In figuring the cost of timbering per ton of ore extracted, an approximation only can be reached, but this may be figured very closely and should include original cost of timber, cost of handling on the surface, framing, sending into the mine and placing in position, together with the cost of the necessary hitches that may have to be cut for placing posts, caps or sprags. Lagging should also be included, though often these latter may be recovered and reused elsewhere, when the same may be credited to the stope from which they were removed.

Special timbers cut to measure, such as "sprags" and "butt caps" or "cap sills" must also be charged as well as the blocking and wedges used in the stope. Chute building and maintenance may be charged, like tracks, to a separate account.

The cost of timbering in square sets per ton of ore extracted varies greatly, but usually ranges from 20 cents under favorable conditions, as to cost of timber, character of mine, etc., to 50 or 60 cents under more expensive and less satisfactory conditions. The variable cost of labor also is important, as well as the size of timbers employed. Where very large timbers are used the timber gang from necessity is larger than where the timbers are relatively small, more men being required to handle the large timbers, which are often 30 inches or more in diameter, weighing upwards of 1000 pounds. Of course, filling, where practiced, cannot be charged to timbering, but made a charge under mining expense.



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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
The Gambetta Mine, Madera Co., Cal.	241
The Val Verde Smelter, Val Verde, Ariz.	241
Stopping With Machine Drill.....	245
Proper Angle for Brushes on Dynamo.....	247
The Pinder Concentrator.....	248
Examples of Mine Timbering.....	249
Mining and Metallurgical Patents.....	250
EDITORIAL:	
The Gambetta Mine.....	241
Cost of Mine Timbering.....	241
The Argonaut M. Co. vs. Kennedy M. Co.....	242
Bunker Hill-Last Chance Decision.....	242
New Metallurgical Processes.....	242
More Mine Strikes.....	242
MINING SUMMARY.....	251-252-253-254-255
LATEST MARKET REPORTS.....	256
MISCELLANEOUS:	
Concentrates.....	243
Hydraulic Low-Grade Gravel.....	244
No Sentiment in Mining.....	244
Opportunities in Mining for Small Investors.....	244
Stopping With Machine Drill.....	245
The Bromine Process.....	245
Form of Mine Lease.....	246
The Val Verde Smelter.....	246
Gold and Coal in Curry County, Oregon.....	246
To Prevent Disease in Dynamos.....	247
Milling at the Camp Bird, Colo.....	247
Use of Crude Oil in a Gas Engine.....	248
The Pinder Concentrator.....	248
Test for Precious Metals in Cyanide Solutions.....	248
Examples of Mine Timbering.....	249
Mining and Metallurgical Patents.....	250
Obituary.....	255
Personal.....	256
Commercial Paragraphs.....	256
New Patents.....	256
Notices of Recent Patents.....	256

New Metallurgical Processes.

New metallurgical processes have for many years been a hobby with some men, and among them have been some of the most ingenious and at the same time most worthless combinations of chemicals, mechanical devices, and varied applications of heat, that the human mind can conceive, but there also have been those of real worth—processes that have revolutionized the practice of gold treatment in some districts. Notable among these are the cyanide and harrel-chlorination processes, with their modifications, and more recently the successful application of the bromine process. Smelting has also advanced to a remarkable extent within the past decade. In this direction pyritic smelting, though not a new method of ore treatment, has been successfully applied in the United States, first at Deadwood, S. D., by Franklin R. Carpenter, and later by others at numerous places. In the early history of Colorado smelters were built in almost every camp of prominence, but the knowledge of the smelting was not sufficiently advanced at that time to make success always possible, and in many instances these old plants, erected at great expense, owing to lack of economical transportation facilities, may still be seen, usually monuments to misdirected enterprise. Mills supplanted smelters on every side and made the operation of the mines possible at a profit. Milling in time became reduced to a science, and within recent years, with cyanide or chlorination plants as accessories, ores containing low values are made to yield a profit. But since the advent of successful and inexpensive pyritic smelting the smelters are again coming into favor in many places, but where these are advised and operated by those who have the technical knowledge and the skill which comes with experience, success instead of failure results and may be anticipated. In some instances, where the wet methods and pyritic smelting are in competition for custom ores, the smelters have been able to meet the charges of the mills, but this can only be possible where every condition is favorable to the smelter. The obtaining of the necessary fluxes with ore of suitable character is important. A pyritic smelter located at a distance from cheap limestone can hardly compete with a cyanide or chlorination works of equal tonnage capacity,

where conditions are more favorable to the latter class of reduction works.

This is an era of investigation, and the "process men" still have a wide field for the exercise of their ingenuity, for no one believes that the best has yet been attained in the realm of metallurgical experience. Most of the investigation is being carried out along scientific lines, and little that is valuable is the result of accidental discovery.

More Mine Strikes.

California is the present storm center of strikes among mine, mill and smelter employes. The disturbances in northern California copper mines are being duplicated in central California gold mines. In Amador county, a great gold-producing section, about 1000 men, mostly miners, have ceased work this week. Their demands are for eight hours as a day's work, reinstatement of men who, they claim, were discharged because of affiliation with the miners' union, and recognition of the union. The mine owners are willing to concede all that they can and continue to operate, but deny the right of any employe to dictate who shall or shall not be employed. The real demand is recognition of the union and the employment of none but union men.

The situation in Amador county is different from that in northern California, where the strife is still on; or in Colorado, where arbitration and compromise enabled a resumption of operations. In central California the gold mining business is run on a narrow margin—so narrow that many mine owners and operators are indifferent as to whether they go on or not. So that in case of a continuance of this week's labor disturbances it is not likely that any attempt will be made to import new men to take the places of the strikers. The mines will simply shut down and all operations cease. It is difficult to see what else the mine owners can do. As things have been going they have just about managed to do necessary development work and keep the mines going miner fashion. Of course, they might have gouged the eyes out of the mine, stripped it of its richest ore, and made a temporary spurt of fictitious prosperity, but that is not the California fashion. There is, or was, a fair day's wages for a fair day's work, and in the most of cases a prospect of sufficient profit to keep going. It seems a pity that these things have to be repeated and the same lessons learned over and over again. The only pleasant feature of the present California mine labor disturbance is the unlikelihood of loss of life or destruction resultant upon any armed collision. Of course, the men are losing their wages, the local business communities are losing their ordinary trade, and the mine owners must necessarily share in the attendant loss inevitably occasioned by the cessation of work in an actively operated mine, where constant work is required to keep down the water.

There is much difference in the amount of damage resulting from the flooding of mines in different districts. Where the country rock and the veins are generally hard, as in the Cœur d'Alenes, as determined after the strike there, it was simply a matter of expense in removing the water, when the workings are found intact, with possibly local exceptions; but the character of most of the mines in the gold belt of central California is such that their flooding would mean large expense in any event, if not the complete destruction of a large portion of the underground workings on the vein. This is due to the wide zones of gouge and foliated, soft slate usually accompanying the quartz veins or filling the barren portions of the fissures. When the water rises in these mines great damage results to shafts sunk in the vein, as most of them are; and to levels and stopes. With a complete knowledge of these facts the miners have doubtless given them due consideration before deciding to strike, believing that the several companies could not afford to allow such a condition to obtain, while apparently losing sight of the fact that in some cases the companies are already operating at a loss. That the owners have also weighed this contingency is evident, as the Kennedy company have planked the collars of the several shafts on their property, and it is announced that other mines will do the same. Although the mines of the district affected by the strike are all deep, mostly 2000 feet and over, and are extensively de-

veloped, they are not very wet mines, and the amount of water that would accumulate daily is relatively small when compared with the large excavations in the lower levels, and it would be months before the water would rise to a height sufficient to do irreparable damage; and knowing this to be so the owners have decided to close up for the time, if not permanently.

To argue or discuss or moralize over the situation were useless. Countless columns have been written on this subject in the last twenty-five years. The "strike," as we know it in the United States, is the result and accompaniment of prosperity. Men are singly "striking" all the time somewhere. The man who has made a million and quits work "for good," shows one kind of a "strike." Some men who get \$100 ahead of the world, just as soon strike as not. When the \$100 is spent they are ready to go back to work. Others stand in because they are afraid of being called "scabs." Others strike with an idea that in so doing they are "getting even" with somebody. Others strike because they are told to; a few strike because they faithfully believe that in this way they are advancing the cause of labor, upholding its dignity, hastening the day when there will be better times for all.

Meanwhile the thing is in the air; it is endemic and epidemic. It must run its course in Pennsylvania, California, British Columbia, Colorado, and when the cycle of fat years is followed by the inevitable cycle of lean years, and "hard times" come around again, the present surfeit of strikes will have surcease, and we will all be glad of a chance to have some honest day's work to do.

Bunker Hill-Last Chance Decision.

The long-contested suit of the Bunker Hill & Sullivan M. Co. vs. the Last Chance M. Co., in the Cœur d'Alene district, Shoshone county, Idaho, has been decided by Judge Truitt, master in chancery, in favor of the former company. The litigation involved the extralateral right. The peculiarities of the geology of the district have resulted in a large number of suits of similar character. The mining law requires a locator to take his claim along the croppings of the lode, and he is supposed to pay no attention to the true strike of the vein, but takes his course along its apparent strike. This results in a varying "strike" where the vein dips greatly from the horizontal, and where the topography of the country is rugged. This is the condition in the Cœur d'Alenes, and claims have been laid out along the vein for thousands of feet, these claims having a greatly differing strike, with end lines drawn at many angles. In the case of the Bunker Hill & Sullivan the foot wall of the vein crosses the claim, passing through the side lines. The court has held that the mine is entitled to extralateral right, though the side lines became the end lines. There are many other similar cases in the district, some like that of the Bunker Hill & Sullivan, where the side lines must become the end lines, and others where the end lines are actually crossed by the vein in its apparent strike. In these several contentions the priority of location is an important factor. Where the extralateral rights of two or more claims conflict, the court has granted the right to follow the vein in the direction of the end lines (or the side lines, as the case may be), projected beyond the boundaries of the location on the dip of the vein, but the prior locator takes all the ore in the place of intersection. The right of way is given to each claim, however, through disputed territory, when they may take up the extralateral right in the region beyond the area of conflict.

THE petition for a new hearing in the case of the Argonaut M. Co. vs. Kennedy M. Co. of Jackson, Cal., has been denied by the United States Supreme Court, which recently rendered a decision in favor of the Argonaut Co. This litigation has been in progress for more than eight years, though the Kennedy has operated steadily during this time. The Argonaut Co. worked steadily from 1893 until about two years ago, when they were obliged to suspend on account of the pending litigation. The Supreme Court had given a disputed triangular strip of ground with increasingly greater width in depth to the Argonaut Co. and within this lies ore bodies estimated to be worth not less than \$2,000,000.

CONCENTRATES.

NAILS can sometimes be dispensed with in a lead assay by the use of cyanide of potassium in the flux.

REPLYING to Mazama, Wash., in relation to a constituent of an alloy that looks like gold, magnesium carbonate is meant.

THE best place to learn drill sharpening and tempering is in the blacksmith shop of a mine, where the seeker after information of this class may not only learn by observation, but actually have a hand in the work.

PYRRHOTITE is the monosulphide of iron and is magnetic. In this connection it is interesting to note that some of the pyrrhotite deposits of Sbasta county, Cal., are overlain by a gossan, bearing magnetite—a magnetic iron oxide.

A "CORD" of ore is a unit of measurement in use in Gilpin county, Colorado, and is the equivalent in bulk of a cord of wood—that is, 128 cubic feet. It contains from seven and one-half to nine tons of ore, according to the kind. The ton weight is also in use in the district.

By the "valence" of an atom is meant its capacity to hold in combination other atoms or groups of atoms. Hydrogen which appears to never possess a valence greater than one, has been adopted as a measure of valence. Water is represented by HOH and is written H₂O.

It is never advisable to attempt to "dress" amalgam plates in a stamp mill without first hanging up the stamps, as any gold loosened by the brushes or brooms is likely to be lost if this is not first attended to. The plate should be carefully washed with clean water, but with only moderate pressure, before the dressing begins.

THE sample of pulverized ore from Jerome, Ariz., is micaceous hematite—an iron sesquioxide. This ore occurs in small veins in many places in Yavapai county, Arizona, and near Castle creek a deposit was worked in 1890 which was gold-bearing. The ore in this instance was made up of larger, bright metallic scales, but otherwise resembled the sample.

COPPER ORES containing a large amount of zinc were an undesirable class of ore prior to the recent introduction of electro-magnetic separators, as the copper smelter did not want the zinc and the zinc smelter did not want the copper, and in either works there was a loss; but by employing the magnetic separator two clean products are obtainable, both of which are marketable. Iron with copper ore is not a disadvantage, but it is undesirable with the zinc.

SILVER CYANIDE is similar in its various properties to the chloride, bromide and iodide of silver, and separates as a white precipitate when a solution of hydrocyanic acid is added to silver nitrate. It is insoluble in nitric acid, but easily soluble in ammonia, and is not affected by light as chloride of silver is. It dissolves in a solution of potassium cyanide, which on evaporation yields crystals of KAg(CN)₂, which are soluble in four parts of water, but are permanent on exposure to the atmosphere. This compound is employed in electro-plating.

LIMONITE (brown iron ore) is often called "bog iron ore," but all limonite is not of similar origin. In many mines, other than those worked for their iron values only, limonite occurs abundantly as a result of the oxidation of sulphide ores. This is the case at Leadville, Colo., and at many other places. The gossan covering copper-bearing deposits usually consists largely of limonite. The so-called liver-colored iron ore of lead-silver districts is generally a siliceous limonite, often colored by manganese. These ores in precious metal mines are valuable as a flux at smelters, but are not often worked for the iron they contain.

RIFFLE BARS are sometimes made of steel 1½ inch square, cut in uniform lengths of 6 feet each, the bars are to be square, of exact dimensions, accurately straight, free from wind or twist, and cut off square at both ends. Each bar is to be bored with five holes for ¾-inch spikes, countersunk ¼ inch deep for ¾-inch spike heads, the holes to be spaced 3 inches from ends of bars and 16½ inches apart. The steel riffle bars are mounted on 1½-inch by 6½-inch surfaced pine bars, the steel cleats fastened with ½-inch by 1½-inch wood screws. The riffles are laid in the sluices longitudinally and wedged slightly from each side to keep them in position.

DIAMONDS have been discovered in the United States—in Georgia, North Carolina and California—and have been reported in Wisconsin. All of these have been found in the alluvial, none in the gneiss rock. In each of these localities the peculiar quartzose bydomica schist, itacolumite (also called flexible sandstone), has been found, also in Brazil, South America, and in the Ural mountains of eastern Russia, where diamonds are also found. In South Africa the diamonds occur under different conditions. All of the California diamonds have been found in the beds of ancient streams or in gulches

which have cut through them. No diamonds of great value have been found in the United States.

It has been suggested that the surface of tailings dumps may become enriched by the blowing away of the lighter portions, leaving the heavier grains of sand behind with the values. This may be true in some instances, but it seems to be a matter of easy determination in most cases. The tailings may be screened through a 200-mesh sieve, that passing through representing the slimes, that remaining on the screen representing the coarser portion which would probably not be blown away. If, on careful assay, the slimes were found to be richer than the coarser material, as is usually the case, then it might be assumed that the surface of the dump would be impoverished by the drifting of the wind.

BROMINE does not exist in a free state in nature, but always in combination with metals. It is found in small quantities in many springs and in sea water. A large portion of the bromine of commerce comes from salt springs in West Virginia. It is a dark red, volatile liquid, which freezes at -7° F. and boils at 63°. In handling bromine care must be taken not to inhale the fumes, as it is poisonous, and also corrosive to the skin. It may be obtained from bromides by the action of manganese dioxide and sulphuric acid, in the same manner that chlorine gas is evolved from sodium chloride. In a general way bromine resembles chlorine. It is being employed as a substitute for chlorine in the extraction of gold from its ores at some metallurgical works.

HYDRAULICKING with compound centrifugal pumps may be accomplished satisfactorily under favorable conditions. A three-step 10-inch pump will deliver 225 miner's inches under an equivalent of 150 feet head, requiring 160 H. P. boiler. A three-step 10-inch pump will deliver 200 miner's inches under 200 feet head, with 160 H. P. boiler, and a three-step 8-inch pump will deliver 150 miner's inches under equivalent of 200 feet head, with 124 H. P. boiler. It is suggested that a smaller nozzle than 5 inches be employed, as 5-inch nozzle under 100 pounds pressure, which represents 230 feet head, requires about 1000 miner's inches of water. It is also suggested that a pump be utilized to throw a large volume of water under low head, say 25 feet, to furnish a sufficient volume of water to wash away the gravel piped down by the giant. This is presuming that a large volume is not available for this purpose in the creek bed.

THE sulphide of zinc is technically known as sphalerite, or in German as "blende," and in French "zinc sulfure." The mineral known to Cornish and many other miners as "black jack" is one of the most interesting of minerals. When pure it contains 67.15% metallic zinc, but it usually contains other substances than zinc and sulphur. The most common impurities are iron, manganese and cadmium, and more rarely mercury, lead and tin. Small amounts of gallium, indium and thallium are found in some zinc blende. It is often auriferous or argentiferous. When pure, blende is white or nearly colorless and transparent, but more commonly honey yellow, resinous, or brown to black, occasionally red or green. Its hardness is 3.5 to 4; brittle. With soda on charcoal it gives with the blow pipe after roasting a beautiful green flame. A convenient test is a drop of hydrochloric acid, which evolves sulphuretted hydrogen.

KUTTER'S FORMULA for measures in feet is as follows:

$$v = \left\{ \frac{1.811}{n} + 41.6 + \frac{.00281}{s} \right\} \times \sqrt{rs}$$

$$v = \left\{ 1 + \left[41.6 + \frac{.00281}{s} \right] \times \frac{n}{r} \right\} \times \sqrt{rs}$$

v = the mean velocity in feet per second; r = the hydraulic mean depth in feet, which equals the area of cross section in square feet divided by wetted perimeter in lineal feet; s = the fall of the water surface (b) in any distance (l) divided by that distance, $\frac{b}{l}$ = sine of slope;

n = the co-efficient of roughness, dependent upon the nature of the lining or interior surface of the channel. The value of Kutter's formula depends almost entirely upon the selection of the proper co-efficient of roughness, n. A proper knowledge of this can only be obtained by experience and the comparison of a large number of experiments on the flow of water in different channels. For cast iron pipes it is usual for engineers to assume .013 = n. Most hydraulic engineering books contain tables giving the value of n under the varying conditions in pipes, flumes, ditches, etc.

AS TO the probable cause of the breaking of a pillow block on an engine at Folsom, Cal.: The exhaust system as arranged, though unusual, is apparently not defective. The cause of the breaking of the pillow block was evidently not due to water condensed in exhaust pipe, as within six minutes all the water in that system of piping must have escaped from the vent. It is possible that during the stoppage water may have condensed in the steam pipe leading from boiler to engine, and that on turning on steam suddenly the water, being unable to escape quickly enough through the cylinder cocks, may have caused the breakage. It is possible, also, that a nut may have become loosened in the cylinder, which would cause a breakage or a stoppage of the engine. It is difficult to determine the actual cause of breakage under the circumstances and conditions de-

scribed. Those on the ground have the best opportunity to decide this, but it was not due to water in the exhaust pipe. It is suggested that the open vent at point marked "B" on the drawing be placed on the lower side of the pipe, to more completely drain it, and that the vent be made larger and be provided with a valve. When first starting up, this to be left wide open, but partly closed after the pipe line is well warmed up. The passing of the exhaust pipe through the water tank causes a large condensation of steam in the pipe, which must have a ready exit.

A METHOD for determining the amount of copper in ores generally considered reliable is by electric deposition. Essential conditions are a sufficiently dilute solution, not an excess of free acid, and not too strong an electric current. If these conditions are not present the copper will be spongy, dark colored and difficult to wash. Hydrochloric acid or an excess of nitric acid must be avoided. Arsenic, antimony, bismuth or silver, if present in solution, will cause the copper to be impure, bismuth being particularly undesirable. Should either of these elements be present in the ores they should be removed before precipitation is attempted. Copper determinations by the cyanide method are made as follows: Treat the charge of ore one gram in 7 c.c. of concentrated nitric acid, with 5 c.c. sulphuric acid and 2 c.c. of hydrochloric acid in a 250 c.c. flask. Boil until only sulphuric acid remains and white fumes appear. Cool, add 10 c.c. water and boil until ferric salts are dissolved; cool and add 6 grams pure granulated zinc. Shake the mixture for five minutes, dilute to 50 c.c., and add 20 c.c. of sulphuric acid. When the zinc is dissolved fill the flask with water, let the copper settle and then decant off the water. Wash in this manner, by addition of water and decantation, at least twice. The liquid decanted off should be tested for copper with hydrogen sulphide water. Should it show copper, repeat the assay or filter off the copper sulphate and determine it. Add 5 c.c. of concentrated nitric acid to the residue in the flask, and boil until the copper is dissolved and the red fumes expelled. Dilute the solution to 125 c.c. If silver is present a drop or two of hydrochloric acid will precipitate it. If more than a trace of silver chloride appears filter it off. Add 10 c.c. of strong ammonia. The solution will assume a blue color of greater or less intensity depending on the amount of copper present. Run in a standard solution of cyanide of potassium (made by dissolving 42 grams of pure cyanide of potassium in one liter of water, which gives a solution equivalent to 0.01 gram of pure copper in 5 c.c. of concentrated nitric acid) until color is nearly discharged. Pour the solution on a large ribbed filter and let it all run through. Dilute the filtrate to 180 c.c. and finish the titration. It should only require a little cyanide solution to finish the titration in the filtrate; the little required by the copper left in the insoluble residue and oxide of iron in the filter can be disregarded.

THE right of a junior mineral locator to follow his vein on its dip under patented railroad land has not been determined by the Supreme Court of the United States, and there is a difference of opinion as to the extralateral right in such cases. The United States patent guarantees (presumably) to the patentee of agricultural and railroad lands (returned and supposed to be non-mineral), all the surface and all underneath the surface to the center of the earth. It also grants to the mineral locator having his apex on Government land the extralateral right, whether the claim be patented or not. It will probably require a lawsuit carried to the Supreme Court of the United States to determine this question. If, however, the mineral location were made prior to issue of patent for railroad land, the mineral locator may take the extralateral right. Of this there is no doubt. The case of the Amador-Medean G. M. Co. vs. South Spring Hill G. M. Co. was a case similar, the essential difference being that the Medean was agricultural and not railroad land. These properties are near Amador City, Cal. In this case land was entered as agricultural, the locator paying for the land and receiving a receipt for the same, which was treated by the court as equivalent to a patent, though patent did not issue until later. About two years after the entry of this land another party located and acquired the right to a gold mining claim adjacent to the said agricultural land. This man sold to the South Spring Co., and the agricultural locator who subsequently discovered mineral on his land sold to the Amador-Medean G. M. Co. The South Spring Hill Co., in working their vein, followed it downward across their east side line and underneath the surface of the property of the Amador-Medean Co. The action was ejectment, to recover the possession of that portion of the vein lying underneath the surface of the agricultural patent. The patent contained after the granting clause the following: "And also subject to the rights of the proprietor of a vein, or lode, to extract and remove his ore therefrom, should the same be found to penetrate or intersect the premises hereby granted as provided by law." It is held that the insertion of this clause was of no effect unless it was sustained by law. It is the law and not the instrument of conveyance that creates the reservation. Judge Sawyer of the Ninth U. S. Circuit Court decided in favor of the agricultural patent. The case was carried to the Supreme Court of the United States, but the suit was dismissed by reason of the South Spring Hill Co. having bought the Amador-Medean property, consequently leaving the question still undetermined as related to agricultural land.

Hydraulicking Low-Grade Gravel.

Written for the MINING AND SCIENTIFIC PRESS by
P. BOUVERY, E. M.

Under the title "Hydraulic Mining in Low-Grade Gravel," the MINING AND SCIENTIFIC PRESS of Nov. 16, 1901, published a very interesting study giving results obtained by working this kind of gravel. If they are not quite satisfactory, financially speaking, they are at least of value to the engineer.

Guided by that note, we give the following results connected with the same ideas and encouraging to the owners of such placers.

The placer of which we write is in California. Capital has been invested for the purchase of the ground and for the water. This is conducted to the mine by a trapezoidal flume, followed by a ditch, making a total length of 30 miles, with a capacity of 3000 miner's inches. The nature of the ground through which the ditch has been dug, the steep slope of the hills and the inclemency of the winter months are the chief causes for the large expenses of maintenance, being about 22% of the total amount of operative expenses.

During the first years of its existence the company owned a water right which in the years of heaviest rainfall flowed over 450,000 miner's inches annually. Since then they have extended the water rights, and are now able to conduct to the mine, according to the winter, from 650,000 to 750,000 miner's inches annually.

This large supply of water—an average of 3000 miner's inches per day during eight months—can not be utilized constantly with profit in the same place. It is necessary for good work to secure several points of attack, allowing changes to be made as well as for moving giants, cleaning up, etc.

The water supply last season was used in the following way:

First mine.....82%
Second mine.....13%
Electric light, derricks, irrigation, etc.....5%

The difference in the use of the water in both mines has been intentional, founded on the nature of the bank to be washed. One is soft gravel, broken up for over 1 mile in length; the other, on the contrary, is a very hard cement, which for profitable working necessitated a special installation of our power plant last year. All our efforts have been concentrated on the first mine, working the second only in case of necessity. We can say, however, and this will seem strange, that twice during the year we ordered the water turned off, preferring to lose it than use it at a loss; but the further results amply counterbalanced the previous losses.

What is said applies equally to both mines, though at the second the results are not so satisfactory as at the first, which, consequently, decreased the average. The expenses and returns of both mines are included in a table below, to furnish an average.

The geological study of the placers worked is very interesting. The formation belongs to two different ancient deposits, the first constituting a lake bed, the second filling the lake. Both formations are gold-bearing gravels, with boulders of every size, from the pebble to the boulder of two and three cubic yards, and requiring water, powder and derrick for their removal, for which purpose the mine is well fitted. The smaller boulders are removed by derrick and cable, the large ones being first blasted.

The bank is broken down by four giants—one at the front, with a head of over 400 feet and nozzle from 7 to 9 inches, according to requirement. Two giants operate on the left side, with a head of from 150 to 250 feet, and one on the right side, with a head of 500 feet, to break the hard cement.

The method of working is the result of long and careful observation and experience and is as follows: Run heavy and keep the sluice clean. Although not easy to do, we have succeeded, and to this we attribute our satisfactory result.

The bank to be washed fills a gulch, the sides of which slope about 30°. On the left it lies on a hard and even bedrock (diorite); on the right it lies on blue clay, resting on decomposed granite, and varies in thickness from 5 feet to 250 feet, containing gold throughout.

Broken by the side giants, the bank is prevented from sliding forward too much by the giant on the front. (We have seen within twenty-four hours the bank sliding forward 100 feet.) By slide is meant the caving down and forward movement of the gravel produced by piping. There is no power strong enough to stop these slides; consequently, the head of the sluice is always far away from the bottom of the bank—about 150 feet—where the front giant is always set.

The sluice is 6 feet wide and 4½ feet high. At the beginning of the last mining season we had but fifty-six boxes, 12 feet long, and at the end of the season 116 boxes, of which fourteen new boxes were at the head and forty-eight boxes at the tail. The grade is 8 inches per box; the pavement is wooden blocks in the first ten boxes and boulders in the others. Two undercurrents collect the fine gold very satisfactorily.

We say the gravel is of low grade, because, in fact,

the numerous prospects panned during the season show an average of from 4 to 6 cents per cubic yard. (We exclude here the prospects which induced the company to buy the property.) Despite this small percentage of gold, we have reached satisfactory results. For the purpose of comparison, in the following table are given the results of several years' operations, those of the last year being the only ones covering our personal management. As to give the figures representing the number of miner's inches and the returns per inch would be incompetent, we have referred to the full result of the expenses and returns, in order to point out, first, the cost; second, the returns, and, by deduction, the cost per dollar of gold produced:

COST AND RETURNS PER MINER'S INCH.

	1895.	1896.	1897.	1898.	1899.	1900 (9 Mos.)	1900-01.	1901-02.
Cost.....	\$0.136	\$0.106	\$0.095	\$0.1004	\$0.866	\$0.0081	\$0.0855	\$0.08219
Returns.....	0.136	0.125	0.136	0.503	0.100	0.0738	0.0665	0.1418
Cost per \$1 extracted.....	1.000	0.85	0.705	0.972	0.862	0.924	1.289	0.5822

The cubic volume of gravel washed out is practically not obtainable, because, being over 1 mile long, the outside lines of the bank are constantly changing. Without calculating mathematically, we estimate between 2½ and 3 cubic yards as the quantity of gravel washed per miner's inch the last year. The area washed, as compared with the preceding years, shows by rapid triangulation that it was about 2.5 cubic yards more than before. The gravel being exactly the same, the form of the bedrock and its nature remaining identical, we are able to deduce that we have washed more ground and sluiced more gold-bearing gravel.

In order to obtain such results, we have applied the following principles:

1. Increased pressure on the giants.
2. Heavy run in the sluices.
3. Increase of personal responsibilities and, consequently, decrease of some salaries.
4. Decrease of the employees, by using more water power.
5. Three times a week careful inspection of flumes, pipe line, sluices, derricks, etc.

The percentage of gold in the sluices, running full or low, is the same and is distributed as follows:

First recovery first 15 boxes.....73.5%
Second " 30 "13.4%
Undercurrents.....11.5%
Third recovery below undercurrents.....1.6%

Showing that a long sluice line is unnecessary, the coarse gold stops always in the first boxes, the fine being caught by the undercurrents.

To know exactly the proportion of the expenses during the running year, and thereby to try to effect some economies, the figures in the following table give expenses by category and by miner's inch:

CLASSIFICATION OF THE EXPENSES BY CATEGORY AND MINER'S INCH.		
Piping-sluicing.....	\$0.01224	15%
Lengthening sluices.....	0.00073	
Moving machines.....	0.00045	
Moving derricks.....	0.00071	
Removing boulders.....	0.01285	16%
Cleaning up.....	0.00065	
Electric light.....	0.00134	
Blacksmithing.....	0.00136	
Carpentering.....	0.00187	
General repairs.....	0.00507	
Lumber and powder.....	0.00668	
General supplies.....	0.00422	
Maintaining ditch.....	0.01534	22%
Supplies, ditch.....	0.00247	
Reservoir.....	0.00110	
Stable, wagons.....	0.00110	
Taxes.....	0.00422	
General expenses.....	0.00979	12%
	0.08219	

This table shows that 50% of the expenses proceed from: Ditch, 22%; sluicing and piping, 15%; general expenses, 12%; the full amount of others making a series of details not easy to eradicate in running.

As the author of the note published in the MINING AND SCIENTIFIC PRESS of Nov. 16, 1901, truthfully says:

"If results are not yet satisfactory for the stockholders—it is very hard to satisfy them—they show that low-grade placers can be worked with some profit, although it is not so easy to work this kind of placers in comparison with high-grade placers, because the smallest wasting of money can imperil the future welfare of the mine.

SENTIMENT does not prevail in mining. In a few instances outcrops containing values have been spared because they were picturesque, and similar sentimental ideas have occasionally been noted, but ordinarily the miner cares little for scenery, preferring to run it through his mill or smelter if it can be done at a profit.

Opportunities in Mining for Small Investors.

TO THE EDITOR:—It is sometimes said, and with a show of truth, that there are only two classes of people who can with propriety engage in the mining business—those who have plenty of money and can afford to lose it, and those who have nothing to lose. Whatever the truth in the statement it will be found to apply equally to almost any form of financial investment where the promise of returns is at all attractive. Given an investment that has no risks, and the returns will be so small that it offers no in-

ducement for the small investor who desires from his investment something more than the 3% or 4% he receives from the savings banks. Whether a man should withdraw his money from the savings bank or convert his 3% bonds into cash for the purpose of investing in something more promising is his own affair; undoubtedly he takes chances in doing so. But men and women are constantly investing their money in this and that form of enterprise or speculation, from real estate to lottery tickets, and if the truth could be known it would probably appear that a large proportion of these investments are made where the risk is greater and the promise less than in gold mining. There are two methods by which the possessor of small capital may invest in mining: First, by the purchase of mining stocks, and, second, by engaging directly in the business itself, either alone or with trustworthy partners. The first method is largely a speculation. If the mine is good, if it is wisely handled, and if its business is honestly conducted, it will pay. Even with a good mine it is evident that the chances are considerable, and the small stockholder has little to say in the management of the business into which he has put his money. The second method is the safest and most attractive. The field is, of course, not open to men with a few dollars, but on the other hand it is certainly not closed to the man who can control a few thousand. The real gamble in mining is with the prospector. From the time the prospect is found, its development into a mine, or its abandonment, is a perfectly legitimate and ordinarily safe business affair. Not every prospect makes a mine, hardly one in a hundred gets beyond the prospect stage. Only a very few have the "ear marks" of promise, the balance may be safely rejected. Of the few that are promising a large percentage will be eliminated by a small expenditure of labor judiciously applied; one in a hundred, perhaps, will stand the test of examination and development.

Through this work, as indeed through all subsequent work of mining, the investor must be guided by intelligence born of experience; if he lacks experience himself he must secure the services of some experienced man whose intelligence and integrity he can rely upon. Having found a prospect that stands the test, every effort should be expended toward the development of the ore body. There should be no money expended for a mill until sufficient ore is developed to pay for it. Mistakes of this sort are too frequent; in the case of large capital they are blunders, in the case of small capital they are crimes. When the prospect has become a mine, and a mill is needed, great care should be taken to determine by what method the values may best be saved. Samples of the ore, properly taken, should be submitted to men who know their business and have established reputations, and their advice followed. But no method of ore treatment should be adopted that does not follow well-beaten paths. New methods are not to be indiscriminately condemned, but no man with small capital is warranted in experimenting with a new process on a commercial scale.

In gold mining, fortunately, the processes are simple; the stamp mill, or cyanide plant, or a combination of the two, will generally cover the requirements. Where the ore is soft the rotary mills have advantages; and with proper arrangements for preliminary crushing they are not to be despised even for hard rock. With any sort of a mill a good millman is indispensable. A cheap millman is a luxury only a rich concern can afford. From start to finish good management in mine and mill and office is of prime importance. Good management cannot make a poor mine pay, but poor management can soon spoil a good one.

But, it may be said, all this requires too much capital for the small investor. Not necessarily so. A man with experience can engage in gold mining with a very few thousand dollars with a better prospect of succeeding than in almost any other business.

at the present time. Competition, which kills 90% of other business ventures, never invades the field of gold mining. Lacking experience he can, either alone or jointly with others, secure a reliable and experienced man who for a small salary and a provisional interest, will devote his time to finding and developing a promising property, at a total expense of but a few hundred dollars per month, until a mill is needed. The place for the small investor to find a mine is in the mountains among the prospectors, and not often in the offices among the promoters. There are many promising prospects in California, Oregon and Arizona at the present time which with a moderate amount of development would become mines that would pay a handsome net profit if judiciously and economically handled. The opportunities along this line are more numerous than generally supposed. Big capital ignores them and the prospector cannot develop them. There is no trouble to find good prospects and no trouble to sell a "going mine." The crying need is for moderate capital intelligently applied to fill the gap between the prospector and the syndicate.

F. N. FLETCHER.

Berkeley, Cal., March 26.

Stoping With Machine Drill.

There are some deposits of ore which cannot be mined so economically by machine drilling as they can by hand drilling, and there are other deposits which cannot be mined with any profit at all when

to break a large tonnage of low-grade milling ore or of ore of uniform grade containing but little waste. A machine is an awkward thing to handle in a stope, and much time and labor will be saved by hand drilling where only one hole or a few "pop" shots are to be bored. In loose, heavy ground the concussion due to the firing of a number of deeply drilled holes may be so great as to cause the roof to cave and break down the timbers, and in some cases result in the complete loss of the stope. In ground of this character it is necessary to keep the timbering close to the working face, and the holes had better be bored by hand, as the amount of ground broken can be better regulated, and the danger of exposing too much unsupported rock be obviated.

When economy is determined by the cost per foot of driving a heading, hand drilling proves to be more economical than machine drilling except in very hard rock. The advantage gained by using machines is in feet per month, or time, which is the essence of most contracts, and a controlling element in the development of a large property.

I do not think any competent machine drill operator would use a tripod where it would be possible to use a bar. The tripod does not hold the machine so firmly as the bar holds it, and at one setting a greater number of holes can be placed to better advantage by using the bar. The tripod is a clumsy affair, difficult to set up in a stope, and it places the operator in a strained position, especially when drilling "uppers" in overhand stoping.

timber gang builds the sets up as near to them as possible. When a "round" of holes has been drilled the machines and tools are placed in the manway, which is then covered with heavy plank or stulls; an opening left in the partition of the top panel furnishes an exit from the ore chute to the manway. By working in this manner the timber gang does not interfere with the drill men, who continue at work while the timbers are being placed.

For driving ordinary levels I use 2½-inch machines, and for small tunnels I use 3 inch machines. I have tried the large machines in vertical and nearly vertical raises, and have had good men "throw up their jobs" on account of the severe labor of setting up the machines.

The limit to which the air should be compressed for use in rock drills must be determined for each particular case, depending on the hardness of the rock and the speed to be attained. In driving the Newhouse tunnel, at Idaho Springs, Colo., a pressure of 160 pounds was used; the loss of energy in expanding air from this pressure to atmospheric pressure is considerable. Basing my opinion on the meager data I have been able to obtain on the subject, I am inclined to favor the use of high pressure with a return system for underground pumps, hoists, and drills when their distance from the power plant is not too great.

The Bromine Process.

At the Telluride mill in Colorado City, Colo., the plant is now completed. The bromine process has been introduced there, and is reported in successful operation. Mechanically the process does not differ widely from the harrel-chlorination process. The ore, after passing the rolls and having been sampled, is sent through a dryer and thence through finishing rolls, and carried on a belt conveyor to large hoppers, seven in number, whence it goes to calcining furnaces similar to those in use at the chlorination works at Colorado City, excepting at the Portland works, where the Pearce turret furnace is in use. The ore passes from the roasting furnace to a belt conveyor which delivers it to large hoppers constructed above each of the twelve harrels, six being already in operation.

In the chlorination process the ore charge is delivered into the barrel together with bleaching powder (calcium chloride) and sulphuric acid, resulting in the evolution of chlorine gas.

In the bromine process the ore is charged in the same manner, but bromine salts are substituted for the chlorine-making ingredients. Each barrel has a capacity of ten tons of ore, which is charged with the chemicals and 500 gallons of water. After four hours the solution is withdrawn through a filter to precipitation tanks and bromine gas forced into lead-lined wooden towers filled with small spheres of marble. When the bromine has all been forced from the harrel, a solution of caustic soda is poured in at the top, which running down through the interstitial spaces between the spheres absorbs the bromine gas, forming a solution of sodium bromide, which is again used in the harrel. Heretofore the high cost of bromine rendered any process requiring its use too expensive, but the recovery of the bromine in this simple, inexpensive way reduces the cost to a minimum. The gold is precipitated from the solution by means of hydrogen sulphide.

One of the first bromine installations in the United States was at the Buxton mine near Deadwood, South Dakota, where it was introduced by O. P. Ankeny in 1886. The ore treated was quartzite containing gold telluride and had proven refractory to amalgamation and other processes known to metallurgical science at that time. The ore was first calcined in a vertical furnace, crushed wet in an ordinary stamp battery. In front of the battery was an ingenious device for separating the metallic iron resulting from the abrasion of the shoes and dies in crushing the hard quartz. This consisted of a strip of iron plate 4 inches wide extending entirely across a table—similar to amalgam plate tables. Beneath was arranged a series of horseshoe magnets. The pulp passing over the plate carried with it the fine particles of iron, these attracted by the magnets remained on the plate, from which they were removed by an endless belt with fixed scrapers, which moving across the plate constantly swept them to one side, where they were brushed off into a box by revolving brushes. The pulp was delivered to settling tanks, from which it was shovelled and partially dried before charging in the lead-lined rotating barrel. The extraction was higher than had been obtained by any other process tried up to that time, but its use was prohibited by reason of the excessive cost of bromine salts, as the price at that time was considerably higher than now, and there was no means of saving and reusing the bromine. At the Buxton mine the gold was precipitated in the same manner as at the Telluride mill at Colorado City, by means of hydrogen sulphide generated by the action of sulphuric acid upon commercial iron sulphide.

The bromine process as practiced at the Nellie Bly mill at Boulder, Colo., is fully described in the issue of the MINING AND SCIENTIFIC PRESS of Feb. 19, 1898.



MINING AND SCIENTIFIC PRESS

Stoping With Machine Drill.

machines are employed, yet they can be made to yield a satisfactory return when worked by hand. Machine drilled holes cannot be so advantageously placed in any form of deposit as can holes bored by hand drilling, says J. B. Guinn in Engineering News. Some "pay streaks" are so narrow that it would be impossible to win the ore with a machine without breaking an amount of waste which it would be unnecessary to break if hand drilling were adopted. Even in large bodies of ore, especially those occurring in faults where the ore is associated with more or less worthless fault material, it is advisable to break the ore and waste separately, thus permitting underground sorting and stowing of the waste. Machine drills can be used to advantage in stoping when it is necessary or permissible to drill the holes to a considerable depth in order

My experience in the use of compressed air for drilling rock has led me to favor the use of small machines and high pressures. For stoping and making raises I use a 2-inch machine, weight unmounted, ninety-five pounds, worked under a pressure of 110 pounds; I would carry a higher pressure if the plant would bear it. This machine can be mounted and operated by one man. In making raises, broken 4 feet 4 inches wide by 7 feet 10 inches long, I employ two men with two machines mounted on a 3-inch bar 8 feet long; a bar of this length will spring some, but not enough to require bracing. The raise is timbered with 8-inch framed sets, one compartment being used for ore and waste, and the other for men and timbers. The machine men work on a platform supported on stulls above the sets; when they have attained a height of about 20 feet above the sets the

Form of Mine Lease.

One of the most satisfactory methods of working mines carrying irregular sized veins of ore of variable but generally high grade is by leasing. This method is largely in vogue in Colorado, and to some extent in South Dakota, Montana and Arizona, but is less common in California, though some of the pocket mining districts of the latter State are largely operated by the leasing system. The Mizpah mine at Tonopah, Nev., was first opened by this system, and as it is a popular method of developing and operating mines in so many places there is naturally a demand for a form of lease which shall be satisfactory to both owner and lessee. Following is a form of lease which is believed to be satisfactory, at least it outlines the conditions usually set forth in instruments of this kind, but these may be changed or modified to suit both parties to any proposed lease of mining property:

This indenture, made this day of, 190..., between The Mining Company, a corporation in the State of, doing business in the county of and State of, lessor, and, lessee or tenant:

Witnesseth, that the said company, the lessor as aforesaid, for and in consideration of the rents or royalties, covenants and agreements hereinafter mentioned, reserved and contained, and by said lessee stipulated and agreed to be paid, kept and performed, has granted, demised and let, and by these premises does grant, demise and let to the said lessee, upon leasehold only, for the purpose of mining in the manner hereinafter set forth, and not otherwise, to have and to hold unto the said lessee or tenant for the term of months, from the date hereof, expiring at noon on the day of, 190..., unless sooner forfeited or determined through the violation of any covenant hereinafter against the said tenant reserved: All the following described mining property, situated in the county of and State of, to wit:

That part of the lode beginning on the level at a point feet from the shaft; thence along the back of said level feet and in height feet, more or less, to the bottom of the next level above, being the foot level, and only upon the ore streak or seam upon which said levels are run, and not otherwise unless hereinafter in writing stipulated, together with the use, as may be necessary in working said premises, of said level and of shaft and tunnel, in common with said company and its other lessees, contractors and other employees, in such manner as may be hereinafter stipulated.

And in consideration of said demise or lease the lessee doth covenant and agree with said company or lessor that he, the said lessee, will truly do and perform all things required by the following stipulations hereof, subject only to the reservations hereinafter contained:

1. To enter upon said premises and to work the same mine-fashion in manner necessary to good and economical mining, so as to take out and save the greatest amount of ore possible, with due regard to safety of the premises and preservation of adjacent parts of the mine, and in accordance with the special covenants hereinafter reserved.

2. To work and mine said premises steadily and continuously from the date hereof, and to completely and fully stope and work out all merchantable ore from the ground therein before the expiration of the term of this lease, so that no part of the ground shall be buried or covered over.

3. To remove such earth and rock as is necessary as fast as it is broken; to do no underhand stoping; to well and sufficiently timber said premises to the satisfaction of the superintendent of said company, at all points where required by good mining, and to repair all old timbering if necessary.

4. All shafts or winzes, if any required, shall be 3½ feet by 6 feet in the clear, inside of timbering, and all drifts 6½ feet by 4 feet, and substantially timbered and secured in good and workmanlike manner, and all stopes to be secured in like manner by timbering or stalling over the drifts; and the level above said premises shall be secured against sinking into the stope by substantial timbering in such manner as shall be approved by the superintendent of the company.

5. Whenever the company shall, by its employees, contractors or lessees, work any other portion of the mine in such manner as to require the use of the level over which said demised premises are situated, lessee shall keep such level clear, so as not to interfere with such use.

6. All dumps formed in the working of this lease shall be the property of the company; shall be made where directed by the superintendent, and shall not be picked or worked for ore by the lessee.

7. The lessee shall, at all times during the term of this lease, hold and keep safe possession of said leased premises for and as lessee of said company, and will at no time permit the same to be unoccupied, and will permit no person not in his employ, or not having permission from said company, to have access thereto.

8. All work under this lease shall be subject to the

general direction and superintendence of said company, its superintendent and foreman, who shall at all times have full access to all the leased premises.

9. No person or persons shall be employed by or remain in the employ of the lessee whose employment shall at any time be objected to by the superintendent of said company.

10. All ore taken out of said premises by the lessee is and shall be the property of said company, unless otherwise ordered by the superintendent of said company, and shall be delivered by the lessee at such convenient place on the surface as the superintendent shall direct, and shall be properly dressed and sacked by the lessee, and the cost of hauling said ore, and weighing, crushing and assaying the same, shall be paid to said company by said lessee, it being understood that the lessee has full privilege of joining with the agent of the company in seeing to the proper weighing, sampling and assaying of all ore produced under this lease.

11. Said company shall retain as royalty or rental for said premises 60% of all the ore produced by the lessee therefrom, and shall pay to the lessee the value of the remainder of said ore, at the highest market price on the day when the ore is crushed and sampled, less reservations hereinafter stated; the ore retained as royalty and that purchased from lessee to be crushed and sampled together, and to be of the same assay value. The company may have the ore crushed and sampled at such mill as it may select, or may itself crush and sample the ore. The lessee may have control of assays made, and, upon failure of agreement upon assay and price, reference shall be had to arbitration by one or three disinterested persons, whose adjudication shall not be lower than the lowest assay or price, nor higher than the highest assay or price claimed, and shall be final.

12. The lessee and employee shall not set up or make any claim whatsoever to any lode, vein or deposit of ore discovered in the working of this lease, but shall and do hereby concede and quit-claim all title in such discoveries to said company.

13. The lessee shall not acquire any rights from location or construction of any tunnel driven to intersect the demised premises; but all such rights, if any accrue, shall inure to the benefit of said company.

14. All blacksmithing required by the lessee shall be done by the company, unless the superintendent shall otherwise direct, and the price to be paid to the company by the lessee therefor shall not be greater than that charged any other lessee of the company for like work.

15. The said company, when convenient, will furnish to the lessee all mine timbers, lagging, powder, fuse and candles used in working under this lease, for all of which the lessee shall pay to the company the usual price delivered at the mine in like quantities.

16. The company shall do all tramping at the expense of the lessee, unless the superintendent shall otherwise direct.

17. The company may reserve from payments made to lessee for ore 2% thereof until the expiration of this lease, as security that the entire amount of merchantable ore in said demised premises shall be fully stoped out as hereinbefore required, and as security that the covenants of this lease shall be fully performed; and the said lessee hereby especially agrees that if this lease shall be terminated by failure of performance of any of the covenants on his part herein made, or if all said merchantable ore shall not be stoped out before the end of the stated term of this lease, then the money so reserved may be retained in possession, and shall become the absolute property, of said company as liquidated damages for failure of covenants by said lessee. Reservation may also be made from payments to the lessee of all indebtedness due by him to the company.

18. Neither this lease, nor any interest in it, shall be transferable, and any assignment thereof, whether verbal or written, attempted to be made, shall operate as a cancellation of this lease. If said lessee shall at any time cease to personally work, or superintend the work, in said premises, it shall be construed as an abandonment or attempted transfer of the lease, and the company may take immediate possession and annul the lease.

19. It is mutually understood and agreed that said company shall in no event be held liable for damages or any indebtedness that may be incurred by said lessee in working this lease.

20. If said lessee shall hide or secrete or ship any ore in a fraudulent manner, then this lease to become void and of no effect.

21. The foregoing conditions and stipulations shall not be considered as changed or modified in any way except as hereinafter written.

And it is further stipulated and agreed that the superintendent of the said company is hereby constituted sole judge of the fulfillment of the covenants herein entered into by the lessee, and any failure of fulfillment and performance by the lessee of any such covenants or stipulations shall operate as a forfeiture and annulment of this lease, and the term thereof shall come to an end, and the company shall be entitled to immediate and exclusive possession of the leased premises; and at the end of the term of this lease, or upon forfeiture thereof by violation of its covenants, the said lessee agrees to surrender to said company, its agents, superintendent, successor

or assigns, the above demised premises, with the appurtenances and all improvements in good order and condition, with all shafts, tunnels, drifts and other passages thoroughly clear of rubbish, and drained, if necessary. Lessee further agrees and declares this to be his letter of attorney to the acting sheriff of the county, hereby fully authorizing and empowering him, at the request of the lessor, on the termination or forfeiture of this lease, or at any time thereafter, to enter into and take possession of all said leased premises, and the properties thereto belonging, and deliver the same to lessor without process of law, or upon termination of forfeiture as aforesaid, or at any time thereafter, the said company may, at its option, with or without force, with or without process of law, enter upon said premises and dispossess all persons occupying the same.

It is mutually understood and agreed that said company shall in no event be held liable, by virtue of any implied warranty of title or covenant in this lease contained, or otherwise, for quiet enjoyment of the said demised premises, or of the product thereof, in case the lessee should be evicted from the demised premises, or any part thereof, by any title paramount or otherwise, or in case any injunction be granted against either of the parties hereto, restraining them from working under this lease, or upon the demised premises or any part thereof.

In witness whereof the said company has, by its superintendent, hereunto set its hand and official seal, and the said lessee has hereunto set his hand and seal.

....., Lessor.
....., Lessee.

The Val Verde Smelter.

The smelting works of the Val Verde Copper Co., Ltd., are located on the high banks of the Agua Fria river, about 23 miles by railroad and 18 miles by wagon from Prescott, on the Prescott & Eastern Railroad, which is being built into the Bradshaw mountains, and in a short time will also connect with Lynx creek—through the Poland tunnel—an ore-producing section. The Val Verde Co. is at the foot of the valley, where smoke never is troublesome, as it invariably goes up or down the river. As the country is sparsely settled there is no likelihood of its becoming a nuisance. The smelter is about 75 feet above the river; they have an abundant slag dump and a supply of water in the Agua Fria river.

The company owns a large tract of land, which enables them to exclude saloons from their town. They have their own lodging houses, boarding house and commissary department, which make a village in themselves. The town is lit by electric lights, furnished by the company.

The illustration shows the Val Verde smelter, a portion of the town and also the Standard Smelting & Refining Co.'s mill to the left. It was taken a year ago, since which time the size of the smelter has been nearly doubled and a great many buildings added to the town.

The Val Verde Co. are using hot blast instead of cold blast for reduction of the ores, on account of the sulphur, arsenic, zinc and lead which most of their ores and concentrates contain, smelting which with cold blast being considered impracticable, for the reason that the large amount of coke required with cold blast reduces these objectionable elements into the matte, making it objectionable to the matte refiners. The Val Verde Copper Co. produces a clean copper matte, containing no arsenic nor antimony and only a very small percentage of lead and zinc, as by the use of hot blast, heated by the Bretherton hot blast stove, they make a high concentration without preliminary roasting, using about one-third the amount of coke which would be required with cold blast. The hot blast stove, which cost about \$3000, has enabled the company to dispense with a roasting plant, the cost of roasting, besides making a desirable matte and saving about \$80 a day in coke consumption, minus the daily operating expense of \$10 for wood burnt in the stove.

Val Verde, April 3.

Gold and Coal in Curry Co., Oregon.

The United States Geological Survey is about to issue the Port Orford (Oregon) Folio, No. 89, prepared by J. S. Diller, who surveyed the region several years ago.

The folio contains four maps, all representing the same region, but each showing special features. The first is a topographic map. The second, using the first as a base, shows the distribution of the various rock formations. The third calls special attention to those formations which are of economic importance; and the fourth illustrates by sections how these formations lie in the earth. These maps are accompanied by a text which describes the topography and geology of the region.

Port Orford is the only port in the quadrangle. The quadrangle contains about 870 square miles, and is inhabited by about 2000 people, engaged chiefly in agriculture, dairying, stock raising and mining.

The principal mineral resource is gold. Platinum and coal are found, but as yet cannot properly be counted among the resources. The coast has long

been noted for its beach mining, and there is yet considerable activity in a small way.

In the early days rich placers were found along Sixes river and Johnson creek. Search for the source of the gold has led to the discovery of numerous small pockets, especially about Rusty Butte and Poverty Gulch, but no working mines have yet been developed. There is clearly a mineralized belt running east and west near the streams named, and the source of the gold is to be found chiefly in the quartz veins and pockets of the region.

To Prevent Disease in Dynamos.

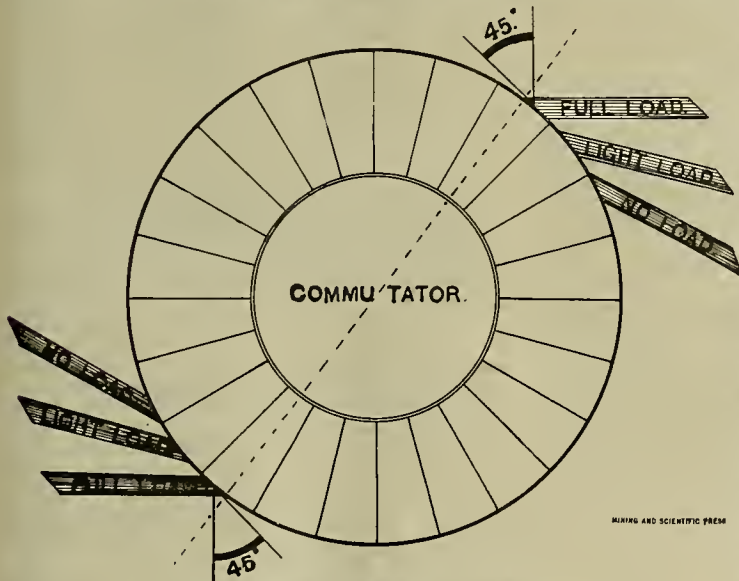
Written for the MINING AND SCIENTIFIC PRESS by
W. H. KRITZER, E. E.

It is assumed that the machine has been installed on an insulated, substantial and level foundation, free from vibration, and accessible on all sides in an airy, clean, cool, dry place, preferably of low temperature, and free from flying particles of any kind; also the attendant has some knowledge of the rudiments of electricity, and the principles involved in the different styles of dynamos.

Be sure when starting that the belt is tight, lubricators filled, all connections correct, the brushes properly trimmed and secured in their holders. After starting put down the brushes, close circuit switch and cut out rheostat resistance. When stopping, open circuit switch, cut in rheostat resistance, raise the brushes, then slow down.

Be sure that an excessive heating of the bearings is not caused by belt being stretched too tight, bent armature shaft, bearings out of line, journal boxes too tight, journals rough—due to improperly scraped boxes, oil of poor quality, overloaded dynamos.

To prevent sparking, be sure the brush holder tension springs allow a certain amount of movement and sufficient pressure to make a good contact; that the brushes are not spread apart and filled with oil or dirt, have no ragged edges or hard burnt ends, do not cut or scratch the commutator; and see



Proper Angle for Brushes on Dynamo.

that they are not overloaded beyond their capacity, that they extend from the brush holders equal length and are not set crooked but get full face of brush at the proper bevel; that the brushes rest against the commutator and the contact points are set diametrically opposite as well as in a neutral position (in bi-polar). In multi-polar machines these positions should be determined by the number of poles.

Be sure and never lift a brush while a dynamo is generating current, except when there are other brushes on the same stud, to remain in contact.

Be sure that the commutator is not dirty, oily, rough, worn on edges, or out of true circumference; that it is not overloaded, or has a high or low bar, or a high, hard mica between the segments.

Also that it has no section short circuited or a broken or loose connection between commutator and armature coils.

Be sure that an armature coil is not short circuited, has an open coil, or is grounded.

Be sure the field's coils are not weak and have no disconnections or short circuits.

Be sure there is no leak from the windings to the frames.

Be sure and keep the machine scrupulously clean in all parts at all times and never let a fault go without attention.

The illustration shows the angle to set brushes when carrying full load.

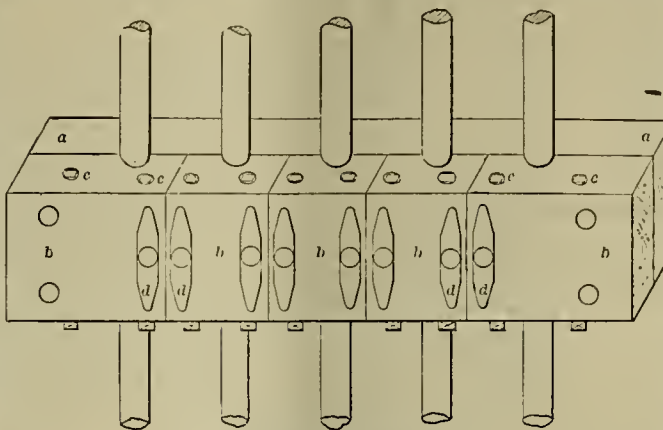
It is locally reported at Lead City, S. D., that the Homestake combination of mines has produced \$90,000,000 since 1877. There are 900 stamps in operation.

Milling at the Camp Bird, Colo.*

NUMBER II.

By THOMAS H. WOODS and GODFREY D. DOVETON.

The discharge area of the screens is 50 inches by 8 inches. The stamp duty is at present 3.11 tons (dry ore) per stamp per day. Sectional guides are in use on forty head of stamps. This type of guide was designed by W. MacDonough, superintendent of construction. It will be seen that this is a quick guide in turning stems, and is very firm and rigid in construction. As may be seen in the drawing, specially



The MacDonough Stamp-Guide.

cast washers (d d) are used, instead of the ordinary round washers, for the purpose of more securely holding the guide over its full width. The $\frac{1}{2}$ -inch bolts (c c) are put in crosswise, in order to prevent the splitting of the guides. On twenty of the stamps the Fargo guide is in use.

The water (twenty gallons per minute) is supplied to the mortar through the feed slot with $\frac{1}{2}$ -inch pipe. This method of feeding the water insures a thorough mixing of the ore. For some unaccountable reason fewer stems have been broken since the back feeding has been adopted. When front feed was in use here (the water being supplied through five small pipes) frequent annoyance was experienced through the tendency of the pipes to jar loose and leak. They were also much in the way when repair work was in progress.

AMALGAMATING PRACTICE.—The plates are 16 feet long, 53 inches wide, of raw annealed copper, $\frac{1}{8}$ inch thick, and have a fall of $\frac{1}{8}$ inch per foot. They are delivered to the mill in 4-foot sections. The method of preparing the plate for service is as follows: The surface is scoured thoroughly by vigorous

rubbing with tailings or a piece of brick, to remove all traces of oxide and expose the bright surface of the metal. Strips of blanketing are placed on the table along the sides and across the line of junction, and the sections of copper securely screwed to the table with brass screws counter sunk. Iron screws rust so rapidly that they are of little use for this purpose. The plate is now thoroughly washed with hot water, and again with a strong solution of lye. The quicksilver is applied a little at a time, and the plate thoroughly amalgamated by vigorous rubbing with a blanket brush. A little dilute cyanide is used during this operation. A new plate, during the first few days it is in service, is dressed usually every two hours, and little or no amalgam is removed, except, perhaps, from the head, until a coating has accumulated.

CLEAN-UP AND DRESSING.—The methods pursued in the daily clean-up of the mill are as follows: The battery being hung up, the plate is carefully washed, the amalgam at the head (sometimes hard and crystalline, due, in the writer's opinion, to the manganese present in the ore) is slightly softened by sprinkling with a small quantity of quicksilver and rubbing with scrubbing brushes, after which the amalgam, commencing at the bottom and working upwards, is removed by means of rubber scrapers. Knives are seldom used, except possibly at the very head. After the amalgam is removed the plates are again sprinkled with mercury, which is thoroughly spread and worked into the copper. Following this operation the plates are brushed with very fine whitewash brushes, and riffled crosswise. During this latter operation the mercury is slightly drawn

to the sides of the plate, consequently the brushes are drawn lengthwise along the sides, from the bottom to the top. This finished, the feed water is turned on and the stamps again dropped. The time of cleaning up and dressing is about twenty minutes to each plate. The plates are cleaned the full length at the morning clean-up, while in the evening the top only is cleaned, unless the ore is unusually rich.

The plates are dressed every three hours, and no mercury is fed into the mortar. Weak solutions of lye and potassium cyanide are employed while dressing, and lime is occasionally supplied to the batteries to neutralize the acidity of the feed water and the ore. No difficulty is experienced in keeping the plates free from verdigris by these methods. An average extraction of 75% is obtained at this stage of the milling, with a resulting loss of .142 to .166 ounce quicksilver per ton.

The amalgam recovered in the mill is immediately conveyed to the amalgam room, and there cleaned and retorted. The impurities which adhere to the plates are very tenacious, and on this account it is necessary to grind the crude amalgam in mortars, for the purpose of mechanically separating the sulphurets and sand. The clean-ups are submitted to two separate grindings. In the first, after softening with additional mercury and grinding for a time in hot water, the hatch breaks, and the partially clean amalgam sinks to the bottom, while most of the impurities float on the top and are skimmed off. The amalgam remaining is then squeezed through canvas bags and freed from excess of mercury. It is then further cleaned by a second grinding, so that very few impurities remain. After being subjected to a further squeezing, the amalgam is retorted. The yield is about 40%, and the fineness of the gold thus recovered is .740.

The sulphurets and other impurities in the ore have a tendency to foul the mercury, and it is therefore necessary to retort all of it before using it again in the mill. The gold is weighed and shipped daily to the mint.

The pulp from each ten stamps, after leaving the plates, is run to traps—simple wooden boxes, 12 by 15 by 8 inches—suspended on iron hangers, with a motion given them similar to that of a vanner. They make 180 strokes, of $\frac{1}{2}$ -inch throw, per minute. On the discharge side they are fitted with long copper lips connected with the vanner launder. The pulp is delivered to the center of the trap, and this and the reciprocating motion of the box prevents the settling and packing of the sands and concentrates, allowing ample opportunity for the amalgam and mercury, which escapes from the plates, to deposit.

The traps have proved very efficient, and at no time has the presence of mercury been detected in the cyanide solutions. Once a week the traps are cleaned and 50 ounces of mercury distributed among the six.

The pulp, on leaving the plates and passing through the traps, is delivered to thirty-six concentrators. Sizing is carried on in pointed boxes, the pulp from each 20 stamps running to six machines; and, as double concentration is in vogue, it is elevated and treated again on a second row of vanners.

The final tailings are delivered to the cyanide works.

CONCENTRATION.—The concentrator equipment consists of thirty 6-foot Frue vanners, and six Wilfley tables. The first row of vanners is fitted with amalgam savers in the form of copper plates fitted to the pulp distributors. The vanners are set up and anchored to massive sills which run the entire length of the building.

Too much care cannot be given to the erection of the concentrators, if good results are to be obtained, the least lost motion in the machine being very noticeable in the results, both at the front and back end of the table. The machines on the coarse side run 190 revolutions per minute, and are given an inclination of $3\frac{1}{2}$ inches in their entire length. On the slime side a speed of 182 revolutions is allowed with an inclination of $2\frac{1}{2}$ inches. The speed and inclination are based upon careful experiments. Corrugated belts are in use on the head machines in the front row. They give very good satisfaction in handling the coarsest of the pulp and have a much greater capacity, although the tailings have a slightly higher value and the resulting concentrates are not quite so clean. However, in view of the second concentration, they are to be recommended.

All these vanners are equipped with sulphuret rollers, and the mud boxes of each machine are connected with settling tanks. Little trouble is experienced from the belt elevators, which travel at a speed of 410 feet per minute, lifting 15 feet. The pulleys are key-seated and set-screwed, and an 8-ply belt is used, having a life of fourteen months.

Lines of track are run in front of each row of vanners, to facilitate handling the sulphurets, which are trammed direct to the dryer building. The dryer

*Trans. Am. Inst. Min. Engs. (condensed).

proper consists of iron-lined shoots or bins, set at an angle of 45°. They are 4 feet wide and are fitted at the bottom with iron gates, for withdrawing the dried concentrates. In the center of each bin are coils of pipe heated with exhaust steam from the mill engine. The concentrates remain in the dryer some three or four days, and by that time the moisture is reduced to about 3%.

Concentration is carried on at a ratio of about 15 to 1, and the average extraction in the concentrating department is about 10% of the whole, giving an average total saving, in the stamp mill alone, of 85%.

The average analysis of the concentrates during an extended period has been:

	Per Cent.
Silica.....	18.00
Galena.....	7.04
Copper pyrite.....	8.20
Iron pyrite.....	30.15
Magnetite.....	7.00
Blende.....	16.50
Rhodinite.....	4.80
Calcite.....	9.00

Total100.69

The analyses of the ore from which these concentrates were produced:

	Per Cent.
Silica and insolubles.....	85.20
Galena.....	.50
Copper pyrite.....	.80
Iron pyrite.....	6.50
Magnetite.....	.50
Blende.....	3.00
Rhodinite.....	2.50
Alumina.....	1.50

Total100.50

The above analyses were made for the writers by W. F. Harris.

The cost of milling the ore in summer is from 48 to 54 cents per ton; in winter, 68 to 72 cents per ton.

POWER.—The boiler equipment consists of a battery of three 150 H. P. water-tube boilers, supplying steam to a 250 H. P. tandem compound Corliss engine. To this the main stamp-mill line shaft is direct connected. By means of a counter shaft, a 100 H. P. Westinghouse generator is connected, which, in turn, furnishes power to the cyanide mill, machine and carpenter shops. The Telluride Power Transmission Co. has erected a station for reserve electrical power, and from it power can be obtained in case of emergency.

In summer a 7-foot Pelton water wheel, working under 175 pounds pressure, supplants the steam equipment. During the latter part of the winter, when the water supply is decreased, owing to natural conditions, a dam is used for settling the water. The slimes accumulated by this dam are treated during the summer months by cyaniding.

The mills, shops, boarding houses and offices are lighted by electricity. The exhaust steam from the engine, which has never over 1½ pound back pressure is utilized for heating the mills by a system of radiators, as well as for running the dryer, the water of condensation being returned, by means of pumps to the boilers.

A common storehouse, both for the mine and mill, forms part of the plant equipment, supplies being charged separately to the various operations.

COST OF MILLING PER TON OF ORE.

Crushing or breaking	Labor.....	\$0.065
	Repairs and maintenance.	0.006
	Labor.....	0.059
	Wear of iron.....	0.048
Pulverizing.....	Screens.....	0.009
	Repairs and maintenance.	0.065
	Lubricants and sundries..	0.002
Amalgamation.....	Labor.....	0.090
	Quicksilver.....	0.007
	Chemicals and sundries..	0.001
Concentration.....	Labor.....	0.042
	Repairs.....	0.030
Power, light and steam heat.....	Labor.....	0.042
	Fuel.....	0.160
	Lubricants and sundries..	0.006
Superintendence day and night.....		0.075

Total milling expenses.....\$0.707

In these costs the separate treatment of the concentrates, per ton of ore milled, is not included.

CYANIDE WORKS AND TREATMENT OF TAILINGS.—The cyanide works are arranged for the direct treatment of the vanner tailings. They have a capacity of about 200 tons per day, but at the present time treat 150 tons daily. Owing to the position of the mill, the tailings have to be elevated a height of 40 feet, and this is accomplished by a No. 4 centrifugal sand pump, running at 650 revolutions. The column pipe is 4 inches in diameter, and 315 gallons of pulp are delivered to the settling vats per minute. The linings of the pump are of manganese steel, and undergo erosion quickly, so that the life of a lining averages six, and under favorable circumstances, eight to ten weeks. A duplicate pump is kept in reserve, ready for immediate use. When worn out, the pump is removed to the machine shop, re-lined and new collars, if necessary, are fitted on the shaft.

(TO BE CONTINUED.)

Use of Crude Oil in a Gas Engine.

Replying to an inquiry as to their experience in the use of Coalinga oil (34° gravity) in gas engines in place of using gasoline, John Rosenfeld's Sons say: "We have not only found that we can run on Coalinga oil at one-fifth the cost of gasoline (72° gravity), but that we can produce power at less cost with Coalinga oil in gas engines than can be done with the cheapest available fuel in the ordinary types of steam engines. We give you the following from our experience at the Vandalia mine, El Dorado county, Cal.:

"When we bought the property they were using gasoline in small gas engines and we continued their use for a short time, gasoline costing from 16 to 18 cents per gallon plus freight from San Francisco or Sacramento, Cal., to the mine.

"In contemplating the enlargement of the plant we had figured on water, electric or steam power. As at first we wanted only 75 to 100 H. P., we were on the point of buying a steam plant, when we heard of a pumping plant that had been using Coalinga crude oil in a gas engine, with a Daniel Best generator attached. We were astonished at the way it figured out, as it seemed cheaper to generate power with the Coalinga oil in a gas engine than with the heavy oils used on boilers, even though the price of Coalinga oil was much higher than the heavy Bakersfield oil; and as against gasoline it seemed to cost less than one-fifth.

"We concluded to hold the steam plant in abeyance until we could test the Coalinga oil to our own satisfaction. We ordered a Best generator (at a very small cost) and attached it to a 10 H. P. Hercules gas engine which we had at the mine, and had them alternately using Coalinga oil and gasoline. We found that we consumed less Coalinga oil than we did 72° gasoline doing the same work.

"As the gasoline cost us five times as much as the Coalinga oil we readily saw that we could no longer afford to use gasoline or distillate.

"At the same time it figured a less cost per horse power on even a 10 H. P. gas engine than we knew the lowest cost to be on a 5000 H. P. highest class steam engine and boiler plant using fuel oil for generating steam. Also, we found the residue from the Coalinga oil a fine lubricant that we could use in place of oil that would cost us 25 cents per gallon; and we had applications from others to buy this residue if we made more than we could use. Upon this showing we concluded to use gas engines and Coalinga oil and we installed a 75 H. P. gas engine and generator, which we have now been running some time very successfully.

"Our mine is on a branch road charging a high rate of freight in addition to the San Francisco terminal rate, and yet we find it costs us less than \$2 per horse power per month of 720 hours for fuel.

"We asked the mine to furnish us accurate data of the consumption of Coalinga oil in the 75 H. P. engine, and received the following: 'The past ten days, when running twenty out of twenty-four hours we have developed 60 H. P. (and at times over) on seven gallons per hour, or .1166 of a gallon per horse power per hour. We also saved 150 gallons of residue, which replaces an equal number of gallons of lubricating oil costing 25 cents per gallon, and which should therefore be credited against the cost of the Coalinga oil.'

"It is our experience that one gallon of Coalinga oil will produce as much power as one and one-half gallons of gasoline.

"From the figures of consumption given above you can arrive at the comparative cost of running gas engines, taking the prices of Coalinga oil and of gasoline at the place where it would be used.

"As some parties are now figuring on a 1000 H. P. plant, and as it appears they could run at lower cost on Coalinga oil with gas engines than with steam engines, we have promised to make some exhaustive tests for them. We feel satisfied, however, they will show fully as well, as we have found the results the same on both the 10 and 75 H. P. engines. We can switch over to gasoline any time, so that the comparison at least is easily demonstrated. In fact our men running the engines say they can notice the stronger effect of Coalinga oil immediately they switch on to it."

The Pinder Concentrator.

In the Pinder concentrating table, illustrated here-with, the form of the table is that of a pan or batea shaped as an involute with its plain surface sloping



The Pinder Concentrator.

to the center, where all the tailings are discharged through a suitable spout. This part of the table top is flexible. Turning the hand wheel, shown in the center, automatically adjusts the slope of the surface of the table, and is thus intended to suit varying conditions in actual practice. The tapering riffles are made of special rubber composition; the dimensions may be varied to suit different conditions. They are tacked and cemented on this surface in a spiral form, the feather ends terminating in a circle near the outer edge of the table.

The pulp is fed upon the table through a series of holes in the outer side of the circular pulp box, which is 8 feet in length, near the heavy end or head of the riffles. It flows down and around the adjustably inclined surface, across the forty-six riffles, towards the center discharge. The table is ball bearing, the movement imparting a quick motion at the outer end of its stroke and a much slower motion at the inner end. This stroke may be shortened or lengthened to suit the requirements of the different ores. The pulp is kept in motion under a thin, evenly distributed flow of wash water issuing from the openings in the pipe suspended over and around the outer edge of the table. The mass moves down the circular incline; the riffles catch the ore particles and conduct them to a point where several fingers are arranged to separate the concentrates into different grades.

The pulp, or concentrates, travel 26 feet along and around the cleaning surface of the table.

The capacity of the table is rated at fifteen to thirty tons, or five to ten stamps; horse power required, ½; floor space, 8½x11½ feet; shipping weight, 2800 pounds, boxed. It is manufactured by the Joshua Hendy Machine Works, San Francisco, Cal.

Test for Precious Metals in Cyanide Solutions.*

By ALBERT ARENTS, Alameda, California.

This test is based upon the fact that metallic copper will precipitate gold and silver upon its surface from acid solutions. Of course, the fact is not new, but its application is probably so. I have used the method with success; it recommends itself by the rapidity and ease with which it may be carried on.

An auriferous cyanide solution, if made acid with sulphuric acid and boiled with finely divided, pulverulent, metallic copper, will, within a short time, deposit its gold content on the copper. Any silver in the solution is also precipitated. If this mixture is now filtered, the filter and contents may at once be subjected to a crucible assay treatment, and its lead buttons cupelled and determined.

If, instead of taking cement copper, or any metallic copper powder, a solution of bluestone is used after acidification, and a few small pieces of sheet aluminum are added, and the solution boiled until all the copper has come down, the result as to the precipitation of gold and silver is the same. This modification takes more time and attention in boiling. If aluminum has been used, it should go into the crucible with the filter and its contents. Commercial cement copper is particularly fitted for this test, because the acid, in taking up any basic iron or copper salts of the cement copper, renders the copper as finely divided as it is customary to obtain it in the sluice boxes of "copper leachers." The finer and the more pulverulent the copper is, the greater is its surface and the more energetic the precipitation, thus permitting a minimum amount of copper to be used.

In applying the method, I use, as a rule, 250 c.c. of the solution to be tested; add a few c.c. of sulphuric acid; agitate for several seconds, then add not less (although not much more) than one grain of cement copper. Now follows heating to boiling. This is kept up for about ten minutes, so that the rising steam bubbles keep the mixture well agitated. The mixture is then filtered through a 7-inch diameter gray filter paper. No washing is done. As soon as the filtering is finished, one-third of a crucible charge of flux is added to the filter containing all the sediment of the mixture. Some of the moisture is rapidly absorbed by the flux, which permits the folding of the filter's rim upon the charge and its subsequent removal without loss or tearing. One-third of a crucible charge of flux having previously been placed upon the bottom of the crucible which is to be used for melting, the filter is transferred to the crucible, well tucked down, and the last one-third of the crucible charge is placed on top of the filter in the crucible. It is then ready for the furnace. The filter itself furnishes the reducing agent for the assay. I use thirty grams litharge and the usual amount of borax and soda, employing a No. F crucible for melting. About twenty grams of lead are obtained. The lead button comes out bright and clean, and upon cupelling furnishes a bead free from copper.

Possibly this method of testing for gold and silver may be used upon other solutions than cyanide; also, for solutions from testing metallic copper for precious metals, when the solutions do not contain nitric acid in any form.

*Trans. Am. Inst. Min. Engs.

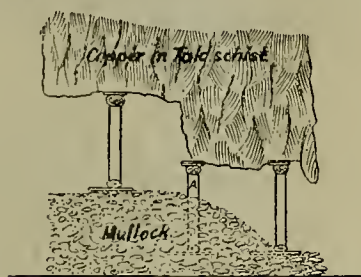
Examples of Mine Timbering.*

Written by W. H. VALE.

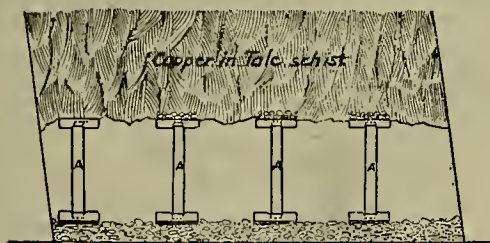
So many emergencies that crop up in mining necessitate a departure from ordinary methods that the writer has been led to illustrate a few of the examples that have come under his notice during a somewhat lengthy career; and as most of the methods illustrated are certainly outside the ordinary, it may be hoped that while to many they may convey little that is new, to the larger number some acceptable information may be gleaned whenever the occasion calls for it.

Experience has shown that there can be no hard and fast rule in mine timbering that will fit the varying necessities of different localities, and the engineer must divest his mind of all prejudices that his practice of any particular system or systems may have induced, and must direct his attention to the character of the local timber and its fitness or otherwise for the purpose he has in view. Fortunate indeed are the man and mine that can claim an abundance of good and cheap mining timber; it simplifies, oftentimes, what would be, under unfavorable timber conditions, a difficult problem. In many parts of the State there is either none or at best a scrub; if the latter, he has to either pigstye, balk, or bulkhead, if his ground will permit; if not, and the necessary timber has to be imported, then some system of recovering his timber and using it over and over again may be possible.

As an illustration of this, Figs. 1 and 2 show a method applied to the copper deposits of the Lyell



Longitudinal Section Fig. 1.



Transverse Section Fig. 2.

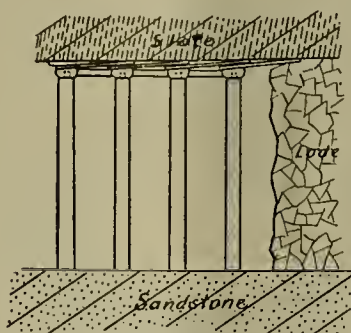
Tharsis, Tasmania. The workings were wide, varying from 30 feet to 50 feet, and the deposit a talcose schist of fairly good standing character. Some occasional styes were used, but the main bulk of the ground was taken up by the timber shown. It will be seen in the transverse section that the vertical timber A has a tenon on both ends and a corresponding mortise in the cap and sill, the latter set on a number of round or rough split pieces, about 4 feet long and bedded on the filling. The leg is then stepped into the sill, the cap adjusted on the leg, and the whole reared up under the ground, which should not reach to within say 4 inches to 8 inches of the back. There is absolutely no necessity to trim the ground, split pieces filling the inequalities and assisting to keep the timber against the shots. The wedges are then driven firmly wherever possible, until the leg rings solid when struck with the hammer.

A stope is shown in the longitudinal section with the mullock filling brought forward until the center leg A is nearly buried. It can then be drawn with the loss of the bottom sill and the rough flooring below.

It will be seen that to apply this method the ground must have some standing character, good enough for 8 or 10 feet at the least, while the filling must be kept up as the work progresses. Under favorable conditions its economy is beyond question, and in many instances that have come under my notice its application would have been satisfactory where the very much more costly system of square setting has been employed.

Figs. 3 and 4 exhibit plan and transverse section of a method employed by the Harrietville gold mines, Victoria. The lode had an underlie to the east of about 60°, varied from 10 feet to 23 feet wide, and was an exceedingly hard quartzite, requiring a large amount of explosives, flying, when broken, with great force. The foot wall was a dense sandstone, the hanging wall totally different—slate, alternating in bars from 10 feet to 12 feet wide. The slate was very treacherous where it came into contact with

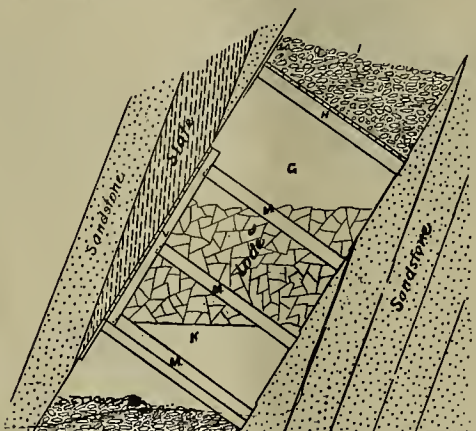
the lode channel. A glance at the section will show that the main difficulty occurred in taking out the last stope approaching the level. It left a great



Plan Fig. 3.

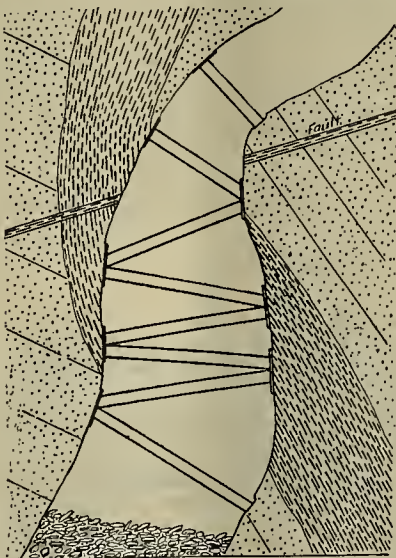
stretch of wall that had to be maintained at any cost—level G, stull timber H, filling overhead I, last stope in lode J, previous stope K, with stulling piece and filling below.

Timber was plentiful and good, consequently cheap, so that it became more a question of keeping the wall against the violence of the explosive than the timber cost, hence the plan adopted. Fifteen-inch to 18-inch timber was split in two to form the strap L, the flat side against the hanging wall, and stepped on to



Transverse Section. Fig. 4.

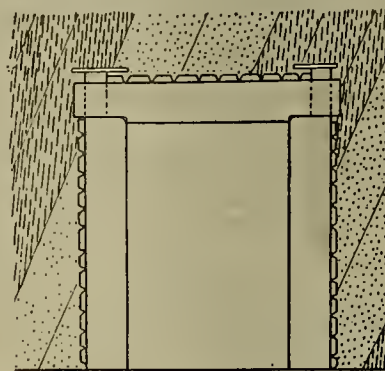
the stull piece below. The headboard of the stull and a lath towards the top of the strap kept the latter sufficiently away from the wall to allow starting the laths. The strap was then temporarily tommed, flat pieces dressed off at the points where the horizontal pieces M would sit, and a mortise cut from nothing at the head to 2½ inches deep at the bottom of the piece when driven home. A tenon was then cut on the piece by allowing the difference between the square of the stick and the level required, as shown in the dotted lines at the head of each piece. The center stull was left out as long as possible, the upper and lower ones driven at once and lagged up permanently (see plan). Once in position, they could only be shifted by smashing them, and this was avoided by employing careful, competent men.



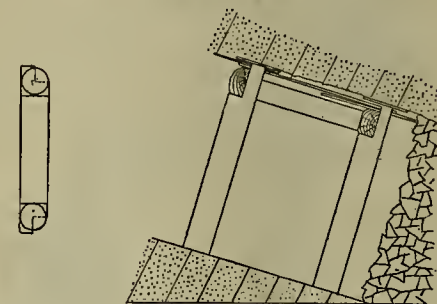
Transverse Section. Fig. 5.

Fig. 5 shows a system of cross-timbering immediately below a faulting, in the same mine. Although no actual dislocation of the lode took place, it was contorted out of position and pinched at the fault to

such an extent as to make two hanging walls, as shown in the section. The country, although similar to that previously described, was, with the lode, very much softer, and at the same time much broken. The main feature lies in footing the stulls on the headboards, as shown, instead of on the pieces themselves. The method is one that is not often required, and men are apt to get hazy over what is called cross-timbering, and are, in consequence, likely to make a mess of it.



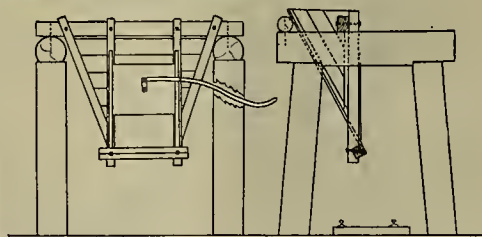
Elevation. Fig. 6.



Plan Fig. 7.

Longitudinal Section Fig. 8.

Figs. 6, 7 and 8 represent what is called a horn set, a form of timbering that can be applied in several ways, and takes its name from the fourth of the leg (see plan, Fig. 7) being carried through the cap and either set onto a headboard (as shown in both section and elevation, Figs. 6 and 8) or cut off flush with the back of the cap piece and utilized as an ordinary set against blasting. As shown in the section, it is being used in a very low underlay shaft, instances of which occur from time to time, and which necessitate some form of timbering sufficiently rigid to withstand blasting with the sets close into the face. The lagging are protected from the shots by the cap piece, which in its turn is kept in position by the lagging, the whole, with the assistance of the horn, making a perfectly rigid set and one that will stand all the stress the timber is capable of.



Front Elevation. Fig. 9.

Transverse Section Fig. 10.

Figs. 9 and 10 exhibit an easily and quickly made ore or mullock pass. Very little explanation is required, as the drawings in both elevation and section



Longitudinal Section Fig. 11
Underground Chamber, United Bros
Mount Wills.

are to scale. The only piece that is "let in" is the 4x4-inch, diagonally into the front hangers and bolted. This forms the lip of the pass and carries the floor;

*Trans. Australian Inst. Min. Engs. (condensed)

the rest of the sawn timber is simply hung on bolts. The frame is generally made on the surface, taken down again, and again put together underground.

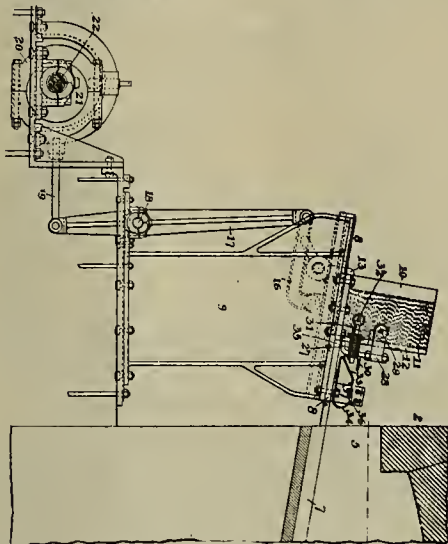
Fig. 11 shows a system of timbering an underground chamber used in the United Brothers' gold mine, Mount Wills, Victoria. It will be observed that the collar set over the shaft has been extended the full width of the chamber and the studs, which are from 12-inch to 15-inch round timber, are mortised into the set. Sawn timber, 12x6-inch, was used to carry the centering and form the skeleton shaft, and the only bolts used in the whole structure were employed drawing the 12x6-inch stuff up the centers so as to prevent warping.

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 7, 1903.

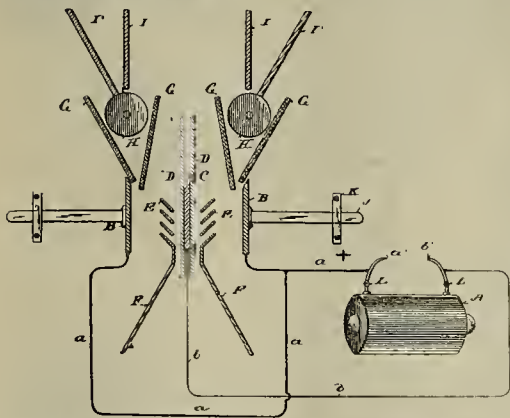
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

FURNACE FEEDING APPARATUS.—No. 724,376; C. W. Bray, Pittsburg, Pa.



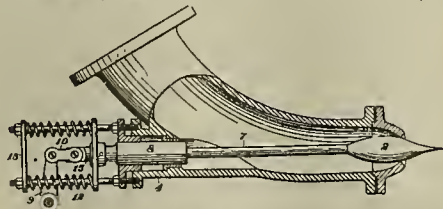
Heating chambers having series feed openings, series stationary feeding devices for moving plates therein, and starting connections for feed devices extending to common point.

ELECTROSTATIC SEPARATOR.—No. 724,679; C. E. Dolbear, Boston, Mass.



In ore separating apparatus, combination of source of high potential electricity, pair similarly charged plates connected therewith between which ore is caused to pass, third oppositely charged plate located between first two, and means for collecting separately separated materials.

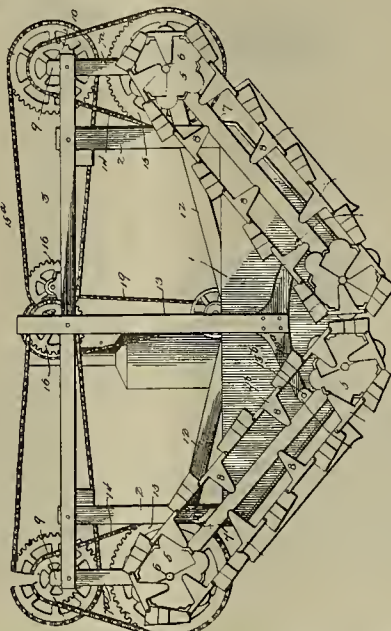
NOZZLE FOR FLUIDS.—No. 724,678; W. A. Dohle, San Francisco, Cal.



In discharging nozzle, adjustable core piece for regulating amount discharge, means for counterbalancing pressure on core piece, means for removing core piece, and means, as springs, for affording variable reinforcement to core piece, as counterbalancing

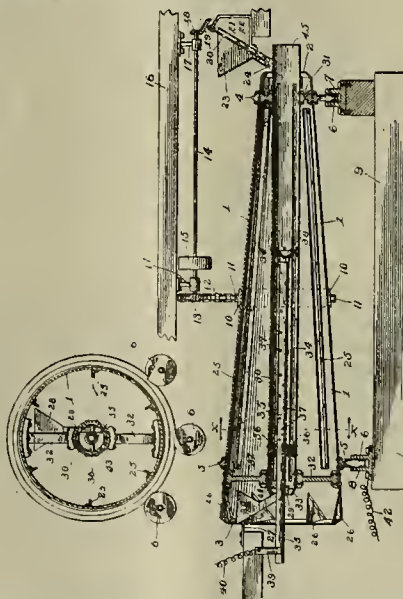
force is disturbed by the opening of variable area of discharge.

DREDGING MACHINE.—No. 724,703; J. W. Humphreys, Iroquois, Ill.



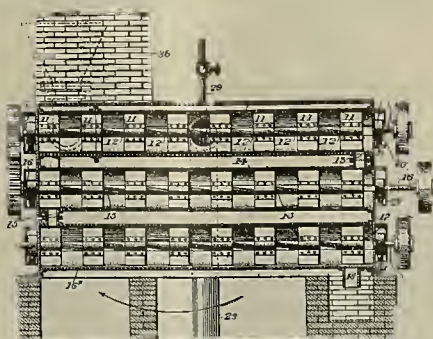
Machine having swinging frame carrying endless belt of scoops, means arranged on frame for actuating scoops, means for removing earth and delivering it to scoops, and means for vertically adjusting swinging frames comprising standard or har yoked up with frames.

ORE SEPARATOR.—No. 724,705; H. G. Johnson and M. S. Howard, Waukon, Iowa.



Ore roasting mechanism comprising base member; supporting trunnions carried by base; conical exterior casing having annular track rails at each end adapted to rest upon trunnions; feed mechanism adapted to deliver ore into one end of outer casing; longitudinally disposed flanges carried by exterior casing adapted to agitate ore therein; interior chamber and pockets carried at one end of exterior chamber whereby ore is delivered from exterior into interior chamber.

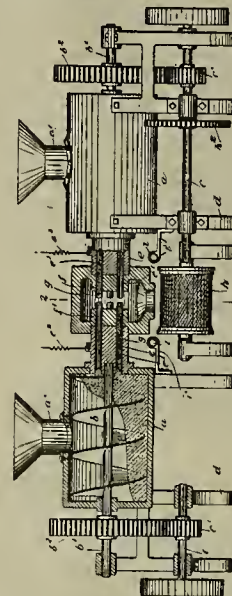
ORE ROASTING FURNACE.—No. 724,942; G. F. Rendall, New York, N. Y.



In ore roasting furnace, hopper, retort, conveyor suitably mounted therein, means for conducting ores from hopper to retort, means for rotating conveyor, second retort situated adjacent first mentioned retort, casings around retorts, roller hearings in casings for shafts of conveyors, conveyor within second

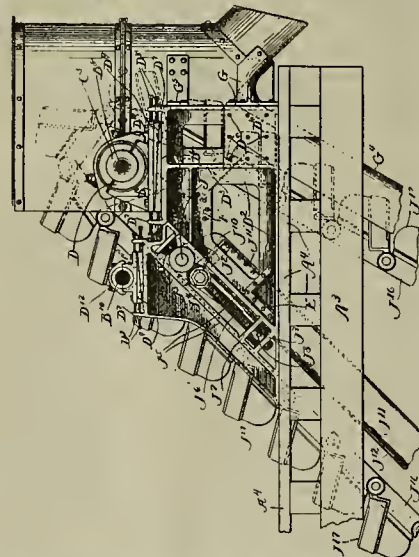
retort, means for rotating conveyor in opposite direction in line of travel of conveyor in first mentioned retort, third retort communicating with second retort at end opposite communication with first retort, conveyor in last mentioned retort having shaft mounted on roller bearings, means for driving conveyor in direction opposite to line of travel of conveyor in second mentioned retort, passages forming communication between interior of retorts at alternately opposite ends, pipe leading downwardly from uppermost retort near its mid-length, steam blast located to discharge directly into vertical portion of pipe, nozzle on end of steam blast pipe within pipe leading from uppermost retort.

ELECTRICAL SMELTING APPARATUS.—No. 724,778; R. L. Barnhart, Charleroi, Pa.



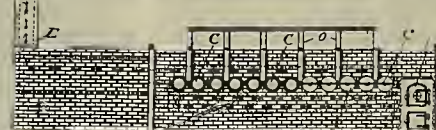
Combination of two oppositely situated orificed heads adapted to be charged with electricity and insulated from each other, means for forcing plastic minerals through orificed heads, forming meeting rods or bars of mineral, and insulating box lying between heads and covering adjacent ends of heads.

SELF-CONTAINED BACK-GEARED HEADSTALL FOR ELEVATOR BUCKET DREDGES.—No. 724,868; G. L. Holmes, Chicago, Ill.



In self-contained back-geared headstall for elevator bucket dredges, combination of high speed driving shaft with low speed driven shaft or quill concentric therewith, gears and pinions connecting one with the other and reducing speed, dredge chain and buckets driven by such driven shaft, and two outer frame pieces in which driving shaft is journaled and two inner frame pieces in which driven shaft is journaled.

QUICKSILVER ROASTER.—No. 724,581; A. Johnson, San Luis Obispo, and R. McKay, San Francisco, Cal.



A device consisting of bench of pipes arranged with doors one extremity, outlets at opposite extremities of pipes, fireplace, winding flue beneath pipes and leading from fireplace, and plurality of arched flues passing over pipes and from winding flues.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The Alaska G. M. & Guaranty Co. is incorporated to construct a smelter at Skagway; W. F. Matlock of Pendleton, Or., W. W. Broughton, C. L. Andrews, J. G. Price, P. E. Kern of Skagway, B. K. Hall is manager. The location is convenient to the quartz camps of Treadwell, Sheep Creek, Whitehorse, Atlin, Silverbow Basin and Sundum and the copper deposits of Rainy Hollow, says the Alaskan.

F. Glengrass, who has a lease of the Wyman property in Copper Mountain district, near Ketchikan, has put in a hoisting plant, and expects to make shipments at the rate of 300 tons per month. The ore will net him \$20 per ton, says the Ketchikan Journal.

The El Capitan M. Co. of Seattle, Wash., owning 960 acres of marble lands on the west coast of Prince of Wales island, will put in channeling machines, drills, saws, derricks and a power plant this spring and quarry out the stone, which is a good quality of white marble, says Manager R. M. Palmer.

Manager W. B. Hoggatt of the Jualin mine at Berner's Bay, on Lynn canal, below Skagway, says machinery will be put in and development work increased this summer.

ARIZONA.

COCHISE COUNTY.

The Calumet & Arizona reports the March production to be 1,307,000 pounds of refined copper.

The Middlemarch M. Co., near Tombstone, will put in a concentrating plant, says Superintendent O'Gorman.

President C. Briggs of the Calumet & Pittsburgh Co., operating near Bisbee, in his annual report says that during the fiscal year ending March 1 a double-drum hoist, a boiler plant, compressor, station pump, buildings, etc., were erected. Exploration work was confined to sinking and cutting stations. The main shaft has been sunk 925 feet, at which point water was struck.

H. Pyeatt and A. Kelly have men at work on the Ozella mine in Lyall canyon, Huachuca mountains, near Bisbee. They report opening up ore carrying gold and copper.

GILA COUNTY.

(Special Correspondence).—The Old Dominion C. M. & S. Co. of Globe are putting in a new smelting plant consisting of three blast furnaces, each 44x180 inches; two converters, 6x10 feet. The buildings will be built of steel. They will use electric crane and electric haulage for the slag pots and charge barrows and will also erect a 250-ton concentrating mill and briquetting plant. They have one briquetting machine on hand and will install two others. Ore will be delivered from mine to smelter by steam locomotive and steel ore cars. The new shaft on the mine will be equipped with steel head frame. They intend to build bins for custom ores. F. W. Hoar is superintendent.

Globe, April 10.

The Black Warrior Co., near Globe, will resume next week, and expect to have the leaching plant in operation by May 1.

A. Walsh has bought the D. R. Williamson one-fifth interest in the McNelly & Crowley group of copper claims on Pinto creek, near Globe, for \$5000.

MOHAVE COUNTY.

(Special Correspondence).—At Chloride, work on the Minnesota mine has been resumed. The 225-ton mill is running on the dump estimated to contain 200,000 tons.

The mill at the Elkhart is running only part time for lack of ore. The mine is working twenty-five men. The principal work is on the 500 level.

The Tennessee mine and mill have resumed work with a full crew. They have been closed down for several weeks owing to a pinching out of ore on the 500 level. It is reported that the 500-foot shaft will be sunk to 1000 feet.

The Midnight mine, belonging to St. Charles Bros. & Babcock of Kingman and Chloride, has been examined recently for a Baker City, Or., mining company. The Midnight has a large tonnage of low grade ore carrying gold, silver and copper, and has 1000 feet of sinking and drifting done.

At Union Pass, the Richardson Bros., superintending and operating the group of gold mines owned by the Portales de Oro M. Co., have a 10-foot vein that averages \$19 per ton.

The Standard M. Co., in the Chichueris mountains, have their main shaft down 75 feet on a small vein of fine milling gold ore.

A 4-foot vein of 10% copper ore has recently been opened on the Paymaster mine at Mineral Park. The ores also carry gold and silver.

At Cerbat new gold discoveries have been made lately. L. Dixon has a vein that goes eight ounces gold to the ton.

A good body of ore is reported in the Climax, owned by J. Dundon, which carries gold and copper.

The Nevada mine has completed 100 feet of drift on the 200 level, and Manager E. F. Holiday has let another contract for sinking a 75-foot shaft on the Tom mine, an extension of the Nevada. These and other properties at Cerbat belong to Redlands, Cal., men.

The Gem mine, owned by T. L. Ayers of San Francisco, Cal., under lease and bond and being worked by H. McKay, is to be taken over by him. He will put in a concentrating plant.

Chloride, April 13.

An additional set of rolls, weighing twenty-five tons, is being set up in the Gold Roads mill, near Kingman.

Work will be resumed on the Homestake group of mines, near Silver Creek, by the Gold Roads Co., owned by R. J. Holmes. C. A. Stevens is superintendent of the company.

At the C. O. D. mine, near Kingman, the drift west on the 300-foot level is in 900 feet. When 1000 feet is reached an upraise will be made to the surface, which will be used as the main working shaft. When this shaft is finished additional men will be put on and stopes opened up. A 100-ton reduction plant will be installed near the new shaft. The ore shoot shows up the full length of the drift and carries values in gold and silver.

PINAL COUNTY.

Near Kelvin, the Troy mine management are reported surveying for a narrow gauge railroad from the mines to a point on the Gila river, where it is intended to erect a smelter. As soon as the P. & E. road is completed to Kelvin, the Ray mine will resume. The oil well near Kelvin is down 1100 feet and sinking at the rate of 5 feet per day; it has passed through a little oil and some gas.

G. Hamlin, superintendent of the Relief gold mine, 22 miles northwest of Phoenix, says a cyanide plant will be erected capable of reducing at least fifty tons of ore per day.

Manager G. W. Hull has men at work in ore in the Dillon and Winningham tunnels on the Cleopatra group, near Jerome, says the News. He will drift on the ore in the Winningham tunnel and sink from it to the Dillon tunnel. A body of ore has been cut near the face of the Dillon tunnel, on the property of the King Development Co.

Superintendent M. Bradley of the Lion G. M. Co. on Cherry creek, near Prescott, has the mill in operation on ore from the Lion mine. Drifting is being pushed from the 450-foot level on an 8-foot vein of milling ore. Bradley has bought the Buffalo quartz claim, adjoining, on which he is driving a tunnel in the ledge, which will open up the ledge to a depth of 350 feet. The ore runs \$40 per ton in gold.

Manager R. De Large has begun the erection of a 10-stamp mill for the Brooklyn Co. on their Cherry creek group, near Prescott.

The capacity of the United Verde smelter at Jerome was increased by blowing in last week one of the larger furnaces recently constructed. Hoisting ore has begun by way of the new hoist.

C. G. Fennell has a lease on the Gladstone mine, near McCabe, and started work this week.

Work has been resumed on the Gold Dust mine of the Hudson group, on Lynx creek, near Prescott. This vein is 3 feet wide, principally gray copper averaging 15%, with gold values of \$15 per ton. The Alice mine of this group shows 5 feet of free-milling gold ore averaging \$20 per ton. Shafts have been sunk, showing the vein at several points.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—The miners' strike is on, and extends from the Central Eureka on the north to the Gwin mine in Calaveras county on the south. About 1000 men are idle. The demands of the miners were made on Monday, the 13th inst., and were in effect that the Union be recognized; that men who have been discharged because of affiliation with the Unions be reinstated; that no miner be discharged without submitting the matter to a committee of the Federation; that working hours be shortened from ten to eight hours; and that there be no decrease in the pay on account of shorter hours. These demands were ignored. On this, Wednesday, morning the engineers and skip men were called out at the Kennedy mine, and that mine is tied up completely. In some of the mines a few are

working, but it is expected all will quit within a day or two. Mine operators say they have nothing to arbitrate, and will make no effort to run, but if the men feel disposed to return to work they may do so. The merchants in most instances have no sympathy with the strikers and say they will refuse credit to men who are on strike. There has been no violence, as no attempt has been made to replace strikers with other men, or to work with those who are willing to continue.

Jackson, April 15.

(Special Correspondence).—The Wildman-Mahoney mine closed down on Monday, as the lessees, who for the past two years have been operating the mine, in view of threatening labor troubles, did not wish to assume additional risks. The mine has been unprofitable for some time past, and can only be made to pay by continuing the new Emerson vertical shaft to a depth of 2000 feet or more, and developing new ore bodies in the lower levels. The Central Eureka mine, near town, and South Eureka, on the top of Sutter hill, are closed by reason of the strike of the miners. The superintendents say the mines will remain idle until the men are ready to return and work under the conditions existing before the strike.

Sutter Creek, April 15.

At the Kennedy mine, near Jackson, the machinery for the hoist is in position and the gallows-frame is being erected. The other twenty stamps of the mill were dropped this week.

The chlorination works at the Zeila mine, near Jackson, were ready for operations last week; but, owing to the unsettled condition of the labor situation, they did not resume, says the Dispatch. This may lead to the shipment of the concentrates to the smelter.

BUTTE COUNTY.

There were eleven placer mining locations filed with the County Recorder at Oroville last week.

CALAVERAS COUNTY.

The Del Monte M. Co. (offices at Jackson, Amador county), report for March shows: Distance run on crosscut, 60 feet, total length 721 feet; cost of labor and materials, \$792.50; cost per foot, \$13.20; drift run from west shaft east, 48 feet; cost of labor and materials, \$151.72; cost per foot, \$3.16; road construction, \$16.50. The rock in the crosscut is extremely hard, having the appearance of quartzite, with stringers of quartz running across it. In the drift above the 200-foot tunnel, passed through 75 feet of ore, and cut the Le Foy shaft. Assays along upper drift west of Le Foy shaft average \$10.

It is reported work on the Lamphear and Moser quartz mines near Mokelumne Hill will be resumed. The group is owned by C. A. Westenberg and S. F. Allen of San Francisco.

The 5-stamp mill at the quartz mine on the John Welch ranch, near Milton, is running steadily. The shaft is down 400 feet on an 8-foot vein.

The Louisiana and Gold Standard mines adjoining the Easy Bird, at Mokelumne Hill, have been handed to J. E. King.

EL DORADO COUNTY.

Lawyer & Hart, representing a San Francisco company, have bought the Ancient Gravel drift mine on Cosumnes river, 7 miles southeast of Latrobe, and will begin development next week.

The Medar quartz mine, near Rescue, has been handed to a San Francisco company.

The 5-stamp mill at the Crystal mine on French creek, near Placerville, started up last week after a short shut down on account of the storm. Twelve men are at work.

The Rustlers M. Co.'s mill on the Gamecock quartz mine, Gold Hill district, near Placerville, is expected to be in operation by May 1. The same company have bought the Mammoth quartz mine on the opposite side of Webber creek, 1 mile south of the Gamecock, and are developing it. They report striking a ledge 14 feet wide, the ore averaging \$4.69 a ton. Drifting is in progress. Power is obtained from a ditch leading out of Webber creek.

At the Whim mine, near Fairplay, the shaft has been sunk 40 feet lower and a ledge 2 feet in width uncovered, says G. S. Estey.

Superintendent C. P. Croft has resumed operations at the Independence mine on Slate mountain, near Placerville. Machinery for the mill will be set up.

FRESNO COUNTY.

The Plymouth Con. Oil Co. has put up another rig near Coalinga and begun drilling.—The Rhode Island-California, drilling east of the field, has one well down 1800 feet, with a small showing of oil, and will drill another well.—The Esperanza has suspended drilling temporarily and is pumping its two producers, which are completed.

INYO COUNTY.

The Roosevelt Oil Co. are drilling 9 miles south of Owens Lake, near Olancho, and are down 1000 feet with oil indications showing.

KERN COUNTY.

The Capital Oil Co. will resume drilling on its ground in Kern River field, near Bakersfield. They are putting up a hydraulic rig, capacity 2000 feet.

The Plinmore mine and mill, near Johannesburg, has been leased to F. Ernst of Johannesburg.

The Good Enough Oil Co., composed of Bakersfield men, will operate in the Cuyama district west of Sunset.

Superintendent W. A. Bouchard has completed retimbering the Sunshine shaft, near Randsburg, which was wrecked by the explosion. Bentley & Bull made their first shipment of bullion from the Hard Cash mine last week. They are working the ore with a dry concentrator.

MARIPOSA COUNTY.

The Ellingham mill, at Whitlock, will start crushing ore next week.

Work on the mines of the Austin Group M. & M. Co., near Whitlock, is progressing. They are handling more water in the Ragan shaft than previously and will put in a pump to replace the baling skip.

MONO COUNTY.

The Bodie Miner-Index says the Castle Peak gold mines will be reopened this summer.

The tunnel of the Crystal Lake G. M. Co. at Lundy will cut the vein at 3160 feet in depth. Twenty miner's inches of water have been cut in the tunnel, adding to the company's power supply. Twenty stamps are dropping in the mill and eighty men are at work.

NEVADA COUNTY.

Thirty men employed at the Gold Tunnel mine, near Nevada City, went out on strike last week because Superintendent J. Eddie gave orders for them to take their lunch in the mine, instead of eating on top.

At the Gold Blossom mine, on Union hill, near Grass Valley, work has been resumed by R. Jeffrey, who owns the group.

Superintendent J. McCaffery of the Polar Star mine, near Grass Valley, says construction work has begun on the buildings for the hoist and the mill.

Operations have resumed at the Standard mine at Deadman's Flat, near Nevada City, owned by Mason & Curtis. F. L. Mason is superintendent.

A 10-stamp mill will be put up at the Gold Tunnel mine, near Nevada City. Excavation work has begun. J. Eddie is superintendent.

PLACER COUNTY.

The Sacramento M. & D. Co. was incorporated last week; F. P. Jackson, M. J. Curtis, W. W. Bassett, B. Welch and E. Franklin; to dredge on the Fowler & Gallagher claim on the American river, near Colfax.

PLUMAS COUNTY.

The Bluff City M. Co. has suspended work at its mine near Quincy, but will resume in the spring, when more men can be worked to advantage, says the Grass Valley Tidings.

SAN DIEGO COUNTY.

The March cleanup of the California King G. M. Co.'s mill at Picacho showed a yield of \$21,441 in bullion and \$2225 in silimes, produced from 7033 tons of ore, showing an average value of \$3.70 a ton, says C. H. Fay of New York, secretary. It is proposed to increase the capacity to 450 tons a day this spring. C. K. Humphrey is superintendent.

F. D. Jones, superintendent of the Smoky City M. Co., has resumed developments in the Elevado mine at Banner.

The Julian Miner says the Glades M. Co., operating the Spring and Oxide mines in Pine valley, near Julian, have opened a 14 foot ledge in the Oxide with a 6-inch pay shoot assaying \$125. The ore is part free-milling, the concentrates assaying \$400. Some of the ore will be cyanided. The company has thirty men at work in the mines and mill. An electric plant has been put in.

SANTA BARBARA COUNTY.

The Casmalia Oil Co. report striking a flow of liquid asphalt in boring for oil on the Arellanes ranch, near Santa Maria, after drilling to a depth of 1500 feet. President T. Ferguson says accompanying the asphalt a heavy flow of natural gas was obtained, which forced the asphalt to the surface at the rate of several barrels per day.

SIERRA COUNTY.

It is reported the Diadem mine, near Forest City, which has been closed for two years, will reopen under new management.—The Messenger says the Young

America gravel mine, below Forest City, will resume by May 1. — At the Twentieth Century mine (formerly Mountain View), pay gravel has been struck.

The Punch Creek quartz mine at Humbug, near Hawkinsville, was started up last week under new management, with D. McCook as superintendent.

TRINITY COUNTY.

M. S. Hotchkiss reports that, after five years of prospecting with varying fortune, he has struck the main pay channel of his Wonder mine on Trinity river, near Junction City. The mine adjoins the Keno mines (Five Pines). The gravel averages \$2 to the pan.

J. Whitmore, J. F. Davis and F. H. Hall, who made the original sale of the Sweepstakes hydraulic mine, near Trinity Center, to the Sweepstakes M. Co.—who abandoned it—propose to reopen it.

The Sykes G. M. Co., operating the Bloss & McClary mine at Trinity Center, are working two giants steadily. The bank averages 100 feet in depth and carries good values. Twelve men are employed on each shift, with E. Ellery superintendent.

At the Headlight quartz mine, on the Trinity river, 3 miles above Trinity Center, a break in the ditch caused a temporary shutdown. The Huntington mills are crushing ore, capacity seventy-five tons per day. The vein is 60 feet in width and carries gold values. Superintendent F. Fletcher has eighteen men at work.

At the Dorleska mine, at the head of Union creek, near Trinity Center, thirty men have been working all winter. There are three mills on the group in constant operation. The richest ore is run through the 5-stamp mill and the lower grade through the other two. The ore shoot carrying the high-grade ore is 60 feet long and the vein averages 16 inches in width, says the Free Press. The lower grade ledge averages 16 feet in width. Los Angeles parties own the property and M. McIlwaine is superintendent.

TUOLUMNE COUNTY.

An oil-burning plant is being put in at the Toledo mine, 1½ mile west of Tuttle-town. The shaft is down 400 feet and drifting east and west from the bottom started.

The Magnet says a hoisting engine has been set up at the 1300 station in the Black Oak mine, near Soulsbyville. The shaft will be sunk an additional 100 feet.

The Vine Spring M. Co. has incorporated; principal place of business, San Francisco; J. D. and E. Barnett, G. F. McPherson, C. B. Tilley, J. J. Roche. They will develop the Vine Spring mine, near Columbia. N. Judson is superintendent.

The App shaft at Quartz is down 1300 feet and drifting begun.

The Porto Fino mine, near Carters, will resume May 1.

The Prudhomme mine, near Groveland, has been unwatered and work resumed. Sinking will be started by June 1.

H. W. McPherson of Los Angeles has bought the G. W. Phillipson interest in the Last Chance and Maud quartz mines, near Hall's Crossing on the Stanislaus river, 2 miles from Confidence.

W. L. Holmes of Detroit, Mich., has bonded the John Royal quartz mine on the E. C. Day place, 2½ miles northeast of Columbia, together with water and other rights; also the Stockton quartz mine, adjoining, for \$50,000. Holmes agrees to erect a 10 stamp mill.

The work of extending the Morris tunnel to tap the Bald Mountain pocket mine, near Columbia, is progressing. The tunnel has been run 500 feet since resuming, and another 150 feet will bring the face directly under the pocket workings. The total length will be 1400 feet. Several pocket mines will be operated through this tunnel.

The Santa Ysabel mine on Quartz mountain, near Stent, is being put in shape for resuming. Twenty-five men are working on the surface moving the gallow's frame from the old works 200 feet north, where the three-compartment incline shaft will be sunk, and putting in the cement foundations for the hoisting machinery, says the Democrat.

COLORADO.

BOULDER COUNTY.

The National Con. Oil Co.'s well, east of Boulder, has for some weeks been producing gas, and, on the strength of this, the company has applied for a franchise to pipe gas into the city for commercial purposes, agreeing to furnish it at 30 cents a thousand feet.

CHAFFEE COUNTY.

Manager Hutchinson of the Red Top M. Co., below Winfield, reports good progress on their tunnel. They will put in air drills this spring and will drive ahead into Sheep mountain, which will make three tunnels developing that district.

One enters from the west slope of the mountain at the head of Boswell gulch, and Manager Foster is in 600 feet cutting some gold veins. Another on the northeast slope, with O. A. Brown as manager, has cut a number of veins, some showing gold values.

Superintendent Taggart of the Tasmania C. M. & M. Co. at Winfield has resumed work on the Last Dollar mine on Hope mountain after a temporary shut down.

CLEAR CREEK COUNTY.

E. W. Williams of Denver is operating the Donaldson, Champton and Trio group on Bellevue mountain, near Idaho Springs. The Trio adit is being driven to reach the Champton workings and 130 feet remain to connect. In the Trio he has 20 inches of smelting ore running five ounces gold to the ton, and alongside of it is a streak of milling ore running two ounces gold to the cord. Men are at work in the Champton driving the sixth level east to connect with the Trio. The Champton shaft is down 1100 feet and all of the levels will be driven into the ore shoot. Leasers are working at the Donaldson mine. The Donaldson mill will be remodeled. A tramway runs to the mill from the Champton mine.

Superintendent Rich last week completed a shipment of seventy-five tons of zinc concentrating material from the Pelican mine, near Silver Plume. A contract has been made to ship 10,000 tons of concentrating material from the upper Mendota dumps. At present it is packed from the dump on burros; but other arrangements will soon be made. Operations on the Pelican have been suspended temporarily, waiting for a mill at Idaho Springs to be completed, which will be able to treat the Pelican ore.

At a meeting of the stockholders of the Waldorf M. & M. Co., in Denver, it was decided to bond their group near Georgetown for \$150,000, for the purpose of erecting a mill to treat the large amount of low-grade ore, which will not stand the cost of transportation in its present form; also, to do more systematic development of the mines. Manager E. J. Wilcox's report shows the ore shipped gives returns of \$200 per ton in lead, silver and gold.

FREMONT COUNTY.

Well No. 305, in which the United Oil Co. struck near Florence oil that yields fifty barrels daily, is being put deeper, to determine what underlies the ground where these strata have been found.

C. Cowan of Coal Creek has a ten-year lease on 160 acres of ground 1 mile south of the Chandler mine. He sunk a 160-foot shaft and struck four veins of bituminous coal measuring from 3½ to 4½ feet thick. Additional machinery will be placed.

GILPIN COUNTY.

W. S. Dexter of Denver has let a contract to sink 30 feet on the Iowa Girl lode, which he owns, near Central City, and intends to put in a plant of machinery.

The Delmonico G. M. Co., operating the Delmonico mine, on Quartz hill, near Central City, are erecting a concentrator near their mine. The mill building will be 36x70 feet and capacity of plant fifty tons per day. E. Steffan is superintendent. It is reported Boston parties have bought the Aduddell property in South Willis gulch, near Central City, for \$65,000, and they intend to operate it through the Newhouse tunnel.

Shull, McLeod & Co., working the El Dorado mine, in Leavenworth gulch, near Central City, under a lease and bond, are making regular shipments to the mill of ore running two ounces gold to the cord, with the tailings averaging \$12 per ton, the ore making three quarters of a ton of tailings to the cord, says the Register-Call.

The Boston-Occidental M. Co. is putting in machinery at its experimental plant at American City to handle the ores of the Mascot group.

The Mackey mine, near Central City, is being worked by L. J. Mountz, owner. A tunnel has been driven in 210 feet, obtaining a depth of 100 feet, and has opened up a body of sulphide ore. Machinery will be put in for further development.

Boston parties are arranging to start up the 2:40 property, near Russell Gulch, under a lease and bond with S. Hoskin of Central City as superintendent. The machinery and shaft building on the unexpected property in Lake district will be moved to the 2:40 mine.

GUNNISON COUNTY.

The Forest Hill Con. M. Co. continues development on the Forest Hill group between Dorchester and Tin Cup. It has on the dumps 8000 tons of low-grade ore. The mill erected below the mine, 2 miles, has treated considerable ore, but it is intended to make some changes in the process of treatment.

The Gold Vein M. Co. has incorporated to operate near Tin Cup; G. Loomis, W.

C. Garlock, H. W. Nicbols, Jr., C. F. Wahl and F. W. Loomis. The company's property is near Cross mountain. Developments will begin next month.

The Dora M. Co. has made extensive preparations to operate its Union Park placer, near Gunnison, this season. It has expended \$125,000 in building ditches, flumes and reservoirs, says Superintendent R. W. Spensley. They own 720 acres of placer ground.

The Jersey Blue mill, in Gold Brick district, near Gunnison, will resume.

The Lead Chief, near Spencer, will be operated this summer. It shows 22 feet of lead ore which assays 20% lead, \$4 in gold and a few ounces in silver. The property is owned by F. O. Miller and D. Phelps.

LAKE COUNTY.

The Leadville News-Dispatch says the Western M. Co., representing the mining interests of the Guggenheim Exploration Co. in the Northwest, has absorbed the A. Y. & Minnie M. & M. Co., the Mahala M. Co. and the A. M. W. M. Co. at Leadville, and Ute & Ulay M. Co. at Lake City (Hinsdale county). The A. M. W. represents the Adams M. Co., Maud of Erin S. M. Co. and Wolfstone Con. M. & M. Co. S. D. Nicholson continues as manager of the new corporation. S. Guggenheim is president of the Western M. Co., W. W. Porter secretary; headquarters, New York City.

G. Campton says work will be resumed on the Homestake mine on Homestake mountain, near Leadville, by May 1.

C. B. Salmon of Beloit, Wis., part owner of the Printer Boy mine near Leadville, says operations will be resumed by May 1.

The Caribou mine, near Leadville, has suspended shipments temporarily, having been unable to secure a satisfactory contract from the smelter. The mine had eighty men at work, but this force has been reduced to twenty.

A diamond drill has been put in at the Valentine mine, near Leadville.

The Ibox cyanide mill near the Arkansas Valley smelter, at Leadville, has been leased by the American Zinc Extraction Co. of Kansas City, who will equip it for a concentration and separation mill. The principal ores treated will be zinc.

The Cloud City M. Co. mine, near Leadville, has been unwatered and the drifts and stopes cleaned out. Shipments of manganese began this week.

Manager Mankuss says work has resumed on the Helen Gould mine, near Leadville. The tunnel is in 320 feet and the shaft down 190 feet.

The Park Lode, in Adelalde Park, near Leadville, being operated by the Buena Vista S. & R. Co., J. McAllister superintendent, is shipping steadily from its copper sulphide bodies and development work is being increased.

The total tonnage output of Leadville for March was 72,500 tons. The increased production was largely due to the added demand for iron ores from the smelters, the rise in the price of lead and spelter, and the general ability, by the erection of mills both by the mine managers and the smelters, to treat a lower grade mineral. The Resurrection mill, only running part time last month, is in full operation and handling 140 tons of ore per day. The Home will increase its output of 200 tons a day, while the Diamond and the Valley combination will be additional shippers.

MINERAL COUNTY.

Manager Fitzgerald of the Humphreys mill at Amethyst says operations have been resumed.

PARK COUNTY.

The Apex Copper Co., owning a group in the Lake George district, is putting in a plant of machinery on the property and the four-drill air compressor has been set up. Besides copper the ore runs \$4 per ton in gold.

The Tarry G. M. & L. Co. has been incorporated at Colorado Springs. The company owns two claims in the Mountain Dale district, near Lake George, and development work is under way. They also have a bond and lease on the Last Shot mine, in Boulder county. H. J. Newman, J. Shumaker, C. P. and E. H. Campbell, C. A. Van Horn, C. D. Welmer and O. H. Stanley are directors.

SAN MIGUEL COUNTY.

(Special Correspondence) — The Argentine vein in the Black Bear tunnel site has been cut. Its width on the north side of the crosscut is 12 feet and 11 feet on the south side. The ore is solid quartz, impregnated with iron and copper sulphide, sulphides of lead (galena) and zinc mixed with galena. The gold and silver values are satisfactory. Drifting on the vein will start at once and preparations made for stopping.

Telluride, April 11.

The crosscut tunnel being driven by the Black Bear M. Co. for the development of

its group at the head of the left fork of Ingram basin, near Telluride, has cut the Argentine lode at a depth of 500 feet, in a body of quartz 12 feet in width. The company owns fourteen lode claims, a millsite and a placer of thirty-five acres. It is proposed to put in a stamp mill next summer. Z. Anderson is president.

SUMMIT COUNTY.

Manager Benyle of Denver, of the Bledsoe M. Co., near Kokomo, says they will resume.

J. M. Thomas of the Fremont-Vlneta M. Co. says a mill will be built on the Swan mine, near Breckenridge, next summer.

The Wilsey mine and mill, near Kokomo, have resumed, says Manager E. E. Byron. Seven tables have been added to the mill equipment.

A strike is reported made in the Rothschild tunnel, near Montezuma. In the crosscut being driven for the last two years with machines, at a distance of 2300 feet from the portal and a depth of 1000 feet, they cut a cross vein of high-grade ore, showing native silver, ruby silver and gray copper. This tunnel starts adjoining the western portal of the Brick Pomeroy tunnel, at Argentine Pass. — The Ohio M. Co., near the same place, report opening up another body of lead-silver ore. This company bought the Pennsylvania mine last summer and will start their mill next month.

TELLER COUNTY.

The Star G. M. Co. has resumed on their Guyot hill group at Cripple Creek and are driving to make an air connection with the Dan McDonald farther up the hill.

The Cripple Creek Ore & Sampling Co. at Cripple Creek resumed operations last week. The company received its first ore from Stratton's Independence, which has its sampling done here, and ships on an average 250 tons of rock daily.

Full operations have been resumed on the Portland No. 2 shaft, repairs to the hoist and gallow's-frame having been made. The new tramway to be used in conveying waste rock from the No. 2 shaft is running. This conveyor is operated by electric power on the trolley system, the buckets dumping automatically while in transit and returning to the shaft house.

The terms of agreement between the Portland G. M. Co. and Colorado City M. & S.'s Union No. 125, relative to the scale of wages and general rules governing the treatment of men, are as follows: The rates being for eight hours' work.

OUTSIDE OF MILL.

	Per Day.
General labor.....	\$2.50
Laborers in shops.....	2.00

IN MILL.

Oilers.....	2.50
Ore unloaders.....	2.40
Crusher feeders.....	2.25
Sample roll men.....	2.50
Sample cutters.....	2.50
Trammers from hoppers.....	2.25
Ore bedders.....	2.25
Bedding floor wheelers.....	2.40
Roll men.....	2.50
Roll helpers.....	2.25
Screen and dust men.....	2.50
Head roaster men.....	2.80
Helpers on roasters.....	2.25
Barrel house foremen.....	3.00
Other men employed continuously about chlorination barrels.....	2.50
Precipitators.....	3.00
Precipitators' helpers.....	2.50
Head concentrator men.....	3.00
Helpers on concentrators.....	2.25
Head machine repairer.....	3.00
Blacksmith.....	3.25
Blacksmith helper.....	2.25
Machinists.....	3.25
Sheet-iron workers.....	3.00
Pumpmen.....	2.50
Boiler firemen.....	2.50
Carpenters.....	3.50

Helpers in shops are paid a minimum of \$2 per day and upward, according to their ability as estimated by the master mechanic.

It is expressly understood that men are hired without discrimination as to their membership in any union and are kept in the employ of the company strictly upon their merits as workmen.

It is also a rule of the company that no agitation of any kind is permitted on the grounds, and that men who make themselves in any way disagreeable to either non-union or union men by arguing or discussing matters not connected with the company's work shall be discharged.

It is agreed by the Mill and Smeltermen's Union No. 125 (W. F. M.), that this scale of wages shall be adhered to for one year, beginning April 1, 1903, and that during this period no attempt will be made by said union to raise the scale.

JAMES F. BURNS,
President Portland G. M. Co.

We, the undersigned members of one

certain executive committee, duly appointed by the Mill and Smeltermen's Union No. 125, Western Federation of Miners, to confer with the Portland G. M. Co. in regard to the scale of wages at the chlorination mill, do hereby accept the attached scale as the true and correct scale adopted and accepted by said Mill and Smeltermen's Union.

In witness whereof we have hereunto set our hands and seals this ninth day of April, 1903.

CHARLES LYON,
H. L. SANGER,
J. H. HILL,
F. M. EDELEN,
L. N. EDWARDS,

Executive Committee M. and S. U. No. 125.

E. R. BURR,
Representative W. F. of M.

The action of the above executive committee in accepting the attached scale of wages is hereby ratified and confirmed by the Mill and Smeltermen's Union No. 125, Western Federation of Miners, by its duly elected president and secretary, and the seal of said union is hereby attached.

THE MILL AND SMELTERMEN'S UNION
No. 125 (W. F. M.)

By L. N. EDWARDS, President.

Attest:
(Seal.) WILLIAM R. ENNIS, Secretary.

The main working shaft of the New Haven, on Raven hill, Cripple Creek, is being sunk an additional 100 feet, and heavier machinery will be added to the equipment.

The Gold Cord Co., operating Blocks 13 and 14 of the Bonanza King, on Gold hill, Cripple Creek, is putting in a steam plant of machinery on its lease. The shaft is down 180 feet, and ore has been opened in three levels averaging \$25 to \$30 per ton, the best showing being on the 135-foot level.

Unwatering the shaft of the Mohawk Belle, near Cripple Creek, is finished and operations resumed.

The Mary Jane Co. has granted a lease on the south end of the Golden Wedge claim, on Raven hill, Cripple Creek, to the Globe M. & R. Co., composed of local men. The Globe Co. are building a cyanide plant at Goldfield and expect to start operations by May 1. They also have a four-year lease on the Ironclad mine, on Ironclad hill. On the Golden Wedge claim there is a vein 9 feet in width of low-grade ore that is amenable to cyanide treatment.

President F. L. Sigel of the Vindicator M. Co., at Cripple Creek, says the winze from the tenth level is down 50 feet, and a north drift in the twelfth level is being run to get under the winze and connect, to give ventilation. The vein in the tenth level at the head of the winze is 26 feet wide and good grade. They are drifting south of the tenth level to open three veins that have been cut in the last year in that section of the mine, and are out 300 feet, with 200 feet more to go before coming to the Sigel vein, opened in cutting the upper workings. The flow of mine water has decreased.

The Arequa mill, in Arequa gulch, near Cripple Creek, was totally destroyed by fire on the 11th inst.; origin thought to have started in the boiler room. The mill cost \$100,000 (insured for \$65,000), and was under lease to Hamilton, Young & Co. This lease was to expire this month, and another lease had been granted to the King-Craig-Metals Extraction Co. of Milwaukee, Wis.

The Cripple Creek Times says the work of driving the drainage tunnel is progressing. From the portal into the connection with the 1000-foot level of the El Paso shaft is 4078 feet, and 1226 feet have been completed. Work has ceased from the intermediate shaft, as the west drive has connected with the drive from the portal, and from the portal one heading is being driven, being in 798 feet. Driving is in progress from five headings, and they are making on an average 35 feet a day. From the east end a drive is being made toward the water course and will continue until the water reaches a certain number of gallons per minute, when that will be bulkheaded until the tunnel is completed from the portal and connected; then the east drive will be completed to the water course in the territory of the Black Belles Co. The water is receding and lowering about 1 foot per month and is now standing at an elevation of 9028 feet above sea level (i. e., at a point 24 feet below the Standard tunnel). Whether the suspension of pumping operations at the Gold King will make any difference has not been ascertained as yet.

Last week the Portland M. Co. put fifty additional men to work on its mines at Cripple Creek. The company is sorting 250 tons of ore per day.

The Work M. Co. has granted a lease on the north 600 feet of the Poorman claim at Cripple Creek to a local company, who will develop it through the Morning Glory shaft of the Doctor-Jack Pot Co.

Operations will be carried out through the 545 foot level.

The Vindicator M. Co. at Cripple Creek will put in another boiler of 267 H. P., bringing their total boiler capacity up to 797 H. P. This increase is needed because of the added pumping necessary.

Gold is reported on the south slope of Grouse mountain, between Wilson creek and Marigold, near Cripple Creek, and a large number of locations have been staked. L. Kafna says he has opened up at a depth of 180 feet ore assaying \$12 gold and 9% copper.

IDAHO.

BOISE COUNTY.

It is reported the Twin Sisters mine, at Centerville, will resume.

IDAHO COUNTY.

The Glasgow-Dundee Con. G. M. Co. has been incorporated at Joplin, Mo., consolidating the Glasgow and Dundee groups and the Missouri group. These groups are in the Big Creek section, Thunder Mountain district, near Roosevelt. The Glasgow and Dundee were under bond to J. D. Cameron of Joplin, Mo., and the Missouri group was under bond to H. L. Hollister and F. C. Rutan. Development work has been done on the Glasgow and Dundee crosscut, which runs through several of the ledges.

The gold bullion produced during March at the American Eagle mine at Elk City amounted to \$8500, says C. K. Merriam, a director of the company. This is somewhat less than for the previous months, but it is due to a considerable quantity of lower grade ore having been run through the mill. The total output of the mine, exclusive of concentrates, since the mill began operations in January, amounts to \$25,000. The upper tunnel gives a depth of 125 feet, while the lower one gives 200 feet. In each the ledge is 20 feet wide, the pay shoot being 6 feet, assaying \$20.

The Sunnyside Co., in Thunder Mountain district, near Roosevelt, is working nineteen men. A 900-foot tunnel has been driven during the winter and is in paying ore. On the Burr Oak claim of the Sunnyside group a 400-foot tunnel has been driven. The company will erect a mill in the summer on Sunnyside creek, $\frac{1}{4}$ mile from the mine.

The Gold Reef M. Co., near Roosevelt, J. Jewell manager, have had men at work all winter. They have driven a 160-foot tunnel on the Monumental group.

LEMHI COUNTY.

The Abandoned mine on Rapps creek, 4 miles from Leesburg, is being developed, says the Lemhi Recorder, and the lead opened up shows 78 feet of ore. The formation is granite, quartz and oxidized iron. The dyke has been cut to a depth of 160 feet, showing free gold ore, the average being \$5 per ton. The conditions are said to be favorable for either plate or cyanide treatment.

The Gold Dust M. Co. will install a 50-stamp mill at its mine near Lemhi this summer, says R. E. Plough of Deseret, Utah, a shareholder.

OWYHEE COUNTY.

The Silver City Nugget reports that J. J. Baker and H. Dye have found the old channel of Rich gulch, near Silver City, and traced the pay gravel for 800 feet. They have filed placer locations, relocated the water right on Sawpit gulch and the abandoned Sullivan ditch.

SHOSHONE COUNTY.

The Wild Rose 3-stamp mill, near Pierce City, started crushing last week. The company has large reserves of ore blocked out and is figuring on a larger mill to be put up this summer.—C. H. Lewis of the Portland and Seattle group reports the tunnel in 60 feet, with 2 feet of ore in the face. The Seattle crosscut is in 90 feet.—Work will be resumed on the Stars and Stripes by May 1.

The Black Cloud mill, on Nine Mile, near Wallace, has been closed for several months. There is sufficient ore blocked out in the California to warrant its continued operation, says the Record.—The Snowstorm tunnel is in 840 feet. There is an abundance of water, and the miners are making an average of 250 feet per month; chalcopryite and hornite are being found. The breast of the tunnel is in porphyry and quartzite. Nine hundred feet remain to be run to cut the main ledge of the Snowstorm group.

WASHINGTON COUNTY.

Manager E. D. Ford says a 14-day mill run of the cyanide plant at the Salzer Ford group at Black Lake, in the Seven Devils district, near Weiser, has proven a success. Tailings show 20 cents per ton.

MICHIGAN.

ONTONAGON COUNTY.

The management of the Victoria mine

at Victoria have begun sinking No. 2 shaft for the nineteenth level. The crosscut at the sixteenth level shows the ledge 50 feet wide with heavy copper for 15 feet on the hanging wall and stamp and barrel copper running through the ledge.

MONTANA.

The report of the United States assay office at Helena for the month of March shows the total receipts of gold for the month, \$177,476 53, of which \$141,473 33 was from Montana, divided as follows: Lewis & Clarke county, \$24,820 51; Fergus county, \$71,095, and Granite county, \$25,562 94. The reason for the greater showing from Fergus county is that the Fergus county ores are worked by mills and cyanide plants, while in the other a large proportion of the gold ores go to the smelters so that their product does not reach the assay office.

BEAVERHEAD COUNTY.

The Watseka mine at Rochester is employing 200 men and the twelve-table mill is nearly completed. The company expects to double its force June 1st.

LEWIS AND CLARKE COUNTY.

The Golconda G. M. Co. has been incorporated at Helena.

R. A. Ball of Helena has closed a deal with Philadelphia men for an interest in the B. & G. mines, 20 miles from Helena, near the Bell mine. There is a shaft 250 feet deep showing a lead of ore which nets \$20 per ton at the smelter. The lead is 20 feet wide in the lower workings. Latsch Bros. & Huffaker are driving a crosscut from the Bland lead—one of the B. & G. group—and have struck a 6-foot vein which shows good ore.

MADISON COUNTY.

Copper-gold ore is reported struck at a depth of 250 feet in the claim of A. Johnson, near Iron Rod, near Pony, a 92-foot ledge being crosscut by a tunnel. The ore from this ledge runs 15% copper and \$15 in gold. A second tunnel is being run, which will tap the ledge at a depth of 900 feet.

The Hennepin Ore Co. has secured control of the Old Galena mine, near Pony, and has men at work.

PARK COUNTY.

The Revenue 40-stamp mill has been started by the Kimberly Mountain G. M. Co., near Livingston. The cyanide plant is expected to be in operation by May 1st.

SILVER BOW COUNTY.

The Pittsburg & Montana C. Co. will build a smelter at Butte on the flat below Columbia Gardens, and machinery is on the ground for preliminary work.

TETON COUNTY.

H. C. Howell & Co. have located 1920 acres in Chief Mountain district, near Choteau, and the Montana & Swift Current Oil Co. is preparing to start drills in several places.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence)—The mill on the Nevada Chief mine has started up. Stopping and developing work in the mine is being pushed. The erection of a cyanide plant is in progress. Algernon Del Mar is superintendent.

Pine Grove, April 12.

LINCOLN COUNTY.

At the Southern Nevada mine, near Searchlight, the south drift, 330-foot level, is in 180 feet, and a west crosscut is being run. Ore is being hoisted from No. 4 shaft; depth, 70 feet. The mill is averaging forty tons a day. In the engine room are two gasoline engines—one a 10 H. P. special electric, the other 28 H. P. Both are equipped to use Coalings, Cal., crude oil. The average number of gallons used daily is eighty-five. (The larger engine alone would consume the same number of gallons of distillate.) Distillate costs 30 cents a gallon laid down here, Coalings crude but 9 cents. When the company used steam, as high as twenty cords of "joshuas" (Spanish Bayonets, a native growth of cacti) were burned a day, costing \$2.25 a cord.

At Deer Lodge, near Fay, in the Homestake mine, recently bought by the Newport & Nevada M. Co., 800 feet of work in shaft and drift work has been done and a body of ore opened up. The company has men sinking from the bottom of the old shaft and opening up additional ground. The values average \$12 gold. The company will erect a 5-stamp mill this spring. The Irus group, which joins the Homestake, has been bonded by G. H. Smith.

E. Freudenthal has an option on the Alpes and Price mines, east of Pioche, and has begun retimbering the shaft. Considerable work will be done in prospecting for the vein formerly worked.

E. Wagner, at Knob Hill, near Search-

light, says at the Wagner Bros' mine the mill is crushing \$40 ore. They are putting in a cyanide plant. Their mill returns show \$30 saved on the plates, the rest going into the tailings.

The Irus G. M. Co. has incorporated at Deseret, Utah; O. J. Sallsbury, G. H. Smith, G. F. Putnam, J. W. Donnellan. The company owns the Nevada lode and a bond and lease on the Irus group, in the Eagle Valley district.

At the Quartette mine, near Searchlight, the 10 stamp mill was put in operation last week—run by a 34 H. P. gasoline engine. A 100 pound shipment of cyanide slimes was made last week to the smelter.

T. W. Olsey has a thirty days' option on the Badger and Mountain Jewel groups of mines near Newberry, near Searchlight.

The Mendha mines, near Pioche, are reported closed down.

NYE COUNTY.

The Molly M. Co., near Butler, will sink their shaft to 500 feet, and at 300 feet a level will be run. A hoist will be put in next month.

STOREY COUNTY.

Manager Ryan reports for the week ending April 11 that at the Con. Cal. & Va. at Virginia City no work was done on the various levels of the mine during the week, due to repairs being made to the hoist. The broken shaft was shipped to San Francisco, Cal., to be welded. To hold the water below the station one of the Reider pumps was in operation during the week, assisted occasionally by another of the same system.

In the Sierra Nevada 1600-foot level the station for the electric motor and blower was completed.

The joint Sierra Nevada and Union east drift from the station advanced 16 feet, total length 444 feet; face in softer material.

At the Utah the concrete foundation for the hoist is being finished.

Work has been resumed at the Woodbury cyanide plant, near Virginia City.

WASHOE COUNTY.

The Galena Hill G. & S. M. Co. has been at work on its group, 12 miles south of Reno. A tunnel is being run to tap the ledge, the face being in quartz that assays \$3.50 a ton.

WHITE PINE COUNTY.

W. H. Edwards & Co. of Salt Lake City, Utah, have bought a group of copper claims comprising the Grand Deposit, Kansas, Defiance, Blue Hen and seventy-six others, and the Noe and Cameron ranches, with ample water rights for all milling and smelting purposes in Munsey Creek district, 35 miles from Cherry creek. They will put up buildings, hoists, compressors and mill machinery. Later a smelter will be erected.

NEW MEXICO.

GRANT COUNTY.

Reports from Hanover say Phelps, Dodge & Co. are increasing development on their group and a mill has been erected. J. W. Bible is mill superintendent.

C. E. Derbyshire is operating the Pinos Altos G. M. Co. group at Pinos Altos, under lease, and is also subleasing.

OREGON.

BAKER COUNTY.

Manager W. L. Vinson of the Emma mine, in Virtue district, near Baker City, says the 25-ton Bryan mill is in operation and a hoist has been set up at 800 feet in the tunnel. The ore averages \$20 per ton and is free-milling.

E. A. Ludwig says the B. & M. and two other mines in Greenhorn district, near Sumpter, have been bonded by Ludwig & Co., who own a group of mines in this district, one of which adjoins the Morning group.

C. Bradley of Spokane, who has taken up the option on the Jay Gould, near Whitney, is arranging to operate on a larger scale and will put up a 10-stamp mill this spring. A crosscut has been driven from the lowest workings on the Jay Gould to open a parallel vein, which is 250 feet distant, and will be finished this week. Three hundred feet beyond this vein is the Oregon, a 4-foot vein.

The Alpha & Omega group of Cove district, near Sumpter, says Manager J. T. Grayson, will resume.

The Killen - Warner - Stewart Co. of Sumpter started operating their placers last week. These include the Pine Creek, near the Bonanza, the Olive Creek, in the Greenhorns, and the Stices Gulch, all equipped with machinery for carrying on work. The Pine Creek—F. A. Bates superintendent—has three reservoirs, which were built last fall, two hydraulic plants, and an elevator to dispose of the tailings and save dump room. The Olive Creek—D. T. McCoy superintendent—has added a No. 2 plant to the two No. 1s already on the ground. A new ditch was

opened up last fall and two reservoirs built. The Stices Gulch placers—J. S. Kenyon superintendent—have three reservoirs, together with giants and other equipment. Last fall piping ditches and 2300 feet of flume were constructed. In addition there is a sawmill.

E. Bamberger of Salt Lake City, Utah, manager of the Gold Ridge M. Co., 4 miles from Durkee, says the pumps are raising water from the shaft below the tunnel level, and next week crosscutting to the ledge will be resumed.

The last 50 feet of the drift on No. 3 vein of the Monumental mine, near Sumpter, has been in a shoot of ore showing ruby silver, with gold values, says C. J. Allen, the owner.

JACKSON COUNTY.

The United States M. & M. Co. has been incorporated by E. A. L. Smith, F. J. Catterlin and J. R. James, to operate a group of mines in Water gulch, Sam's Creek district, 2½ miles from Gold Hill.

JOSEPHINE COUNTY.

The Gold Bug mine, on Mount Reuben, near Grants Pass, has been temporarily closed down, due to an impending change of management. The mine is opened to a depth of 600 feet and shows high-grade ore.

The Copper Stain mine, on Mount Reuben, owned by Dana Bros., will have a stamp mill and other machinery.

GRANT COUNTY.

The tunnel being driven on the Equity group at Quartzburg has opened the second shoot of ore, says Manager W. J. Hughes. The length of the first opened was 120 feet. A concentrator is being put in.

The Empire G. M. & D. Co. of Sumpter has decided to put in dredgers on Canyon creek, a tributary of the John Day river, near Canyon City.

Manager J. W. Carr last week resumed work on the group of the Denver G. M. & M. Co., near Alamo.

SOUTH DAKOTA.

LAWRENCE COUNTY.

It is reported that the Clover Leaf Co., near Roubalx, has struck the pay shoot on the 700-foot level in the Uncle Sam mine.

G. Bertschy, former superintendent of the Tycoon M. Co., has an option on one of the Gertie group, formerly owned by the Harney Peak Tin Co., near Hill City, and has begun operations.

C. K. Shoemaker has begun operations at his mica mine, 3 miles southeast of Custer.

The Horseshoe M. Co., W. L. McLaughlin manager, has resumed work at the Lucille mine, near Terry, and has begun ore shipment. They have started construction work again at the cyanide plant at the Mogul mine, which is expected to be in operation by June 1st. It will have an initial capacity of 500 tons a day. The ore will be crushed by stamps, in the solution of cyanide. It is the intention to put up an aerial tramway for the delivery of ore at the mill.

UTAH.

BEAVER COUNTY.

The annual report of the Horn Silver M. Co., at Frisco, shows \$109,707 receipts from sales of ore. The amount of ore mined was 12,159 tons, of which 4549 tons were shipped crude, the rest being treated in the mill. The first-class crude ore brought \$41,644; the copper ore, \$35,397, and the concentrates \$29,583. The metallic contents of the ore were 203 ounces gold, 112,813 ounces silver, 717,353 pounds copper and 3,657,062 pounds lead.

GRAND COUNTY.

The Dirlgo-La Sal M. Co., on Deep creek, near Basin, in the La Sal mountains, report striking a vein in the cross-cut tunnel, which carries tellurides. The find was made near the hanging wall of the Mollie Gibson vein, which group is owned by this company. A reduction works will be built, says Assistant Manager S. W. West of Salt Lake City.

JUAB COUNTY.

Manager E. Bamberger of the Alaska mine, in Tintic district, near Eureka, says the drift from the 600-foot station of the main working shaft has cut the vein from which ore was taken out on the upper levels. The drift is in 75 feet.

Present shipments made from the Victor mine at Eureka show values of \$25 per ton. For March the shipments amounted to twenty-five cars of ore, and Superintendent Treloar expects to increase the output this month.

PIUTE COUNTY.

(Special Correspondence).—The stockholders of the Annie Laurie Extension Co. have increased the capitalization of

the company because of recent developments on the original group, and to pay for additional ground bought. L. H. Outzen is president. The northern line of the Extension group of twenty-three claims is 1200 feet south of the Annie Laurie on Gold Mountain. There are 3500 feet of tunnelling projected, which is expected to open up the Annie Laurie vein at depth. The surface of the Annie Laurie Extension shows rich quartz. The Extension's ore is similar to that of the Annie Laurie. The Belpat, in Sevier River canyon near the Denver & Rio Grande Western Railway, north of Marysvale, has opened up good ore. W. C. Kenbedy is president. The Snowbirds has opened up the ore shoot at a depth of 300 feet. At the B. W. & H., Superintendent J. W. Billingsly says they have five ore-bearing veins. This week they have opened up a vein 6 feet in width, all ore, 18 inches of which runs \$95 per ton, and the rest averages \$20 per ton. About 1000 sacks of ore are on the dump ready for shipping.

R. De Witt, working the Overlooked, has struck a 4-foot vein in the "bird's-eye" porphyry, assays showing high values in gold and some silver. The Tribune Co. has bonded its group of claims, southwest of the Annie Laurie, to A. H. Franklin for \$45,000. In connection with the Tribune group, Franklin has a bond on the Cummings claims to the east and will open up these properties by means of the 1200-foot tunnel on the Tribune. The Denver & Rio Grande Western Railway has its terminus at Marysvale, and all of these districts can be easily reached from this place.

Marysvale, April 6.

(Special Correspondence).—F. Lallay has located copper claims in Sevier canyon.

The B. W. & H., on Sevier river, continues its output. Shipments are suspended for the present. Extensive developments are being carried on, says Superintendent Billingsly.

W. H. Holderman of Salt Lake is reported as having a bond and lease on the Deer Creek group, and will use his application of the cyanide process in the treatment of the ores.

J. A. Kerr of Denver, Colo., is in camp, representing Duluth, Minn., and Pittsburg, Pa., capital, to secure prospects for development.

M. Krotki, manager of the Perdue-Surprise, is working a large number of men with encouraging prospects.

Marysvale, April 12.

SUMMIT COUNTY.

The Liberty M. Co. has incorporated to work a total of 265 acres of mineral-bearing ground near Park City, including the McHenry Gulch, the Wasatch, Belcher and Romeo groups—T. Kearns, W. M. Ferry, J. Green, J. T. Richards, E. S. Ferry.

The Comstock M. Co. mill at Park City is in operation, says Manager M. Dusseldorf.

TOOELE COUNTY.

The Honoline drain tunnel at Stockton, says Manager W. F. Snyder, cut through the porphyry and entered the limestone formation at a distance of 3900 feet from the mouth last week, tapping a water course, and the water came out at the rate of 2000 gallons per minute. Several mines in the vicinity are beginning to note its effect already in the lessened amount of water to be handled.

A strike of copper ore is reported made in the Ferber district, 25 miles from Ibapah and near the Nevada state line, on claims owned by Garrison, Lewis & Loomis.

O. Sheridan reports that coal has been found between Sanford pass and Weaver canyon, 25 miles from Ibapah.

WASHINGTON.

FERRY COUNTY.

The electro-chemical mill of the Republic Reduction Co., near Republic, will be dismantled.

STEVENS COUNTY.

The Bodie mine on the Colville reservation, near Colville, will have a 10-stamp mill this spring, says C. M. Fassett, one of the shareholders in the company. They expect to adopt a combination of amalgamation and cyaniding. The Bodie carries gold and silver. A shipment of three carloads made recently went \$50 per ton. W. G. Madison of Spokane is president and manager.

WYOMING.

CARBON COUNTY.

S. Fuiks of Battle has bought the Itmay group of four claims 4½ miles west of the Verde mine.

FREMONT COUNTY.

J. H. Lobell, at Cheyenne, American director of the Societe Belgo-Americaine des Petroles du Wyoming and the Belgo-

American Drilling Trust, says his company last week bought the Murphy fields in the Popo-Agie district, near Lander, for \$450,000. In these fields are thirteen producing wells. The deal includes 30,000 acres of oil lands in the Popo-Agie district and in the Rattlesnake and Beaver basins. The company has also bought 5000 acres of oil lands in the Rattlesnake field of Natrona county. They own 30,000 acres in the Salt Wells fields of Sweetwater county and a tract in the Salt Creek basin of Natrona county.

UINTAH COUNTY.

The Round Mountain Oil Co. has been incorporated by Evanston, Wyo., and Sidney, Neb., men to operate in the Uintah field near Evanston.

FOREIGN.

AUSTRALIA.

WEST AUSTRALIA.

(Special Correspondence).—W. A. Prichard (formerly superintendent of the Keystone mine, Amador City, Cal.) and W. J. Loring (former mill superintendent Utica G. M. Co., Angels, Cal.) have been appointed general managers of Bewick, Moreing & Co.'s interests in West Australia, which control twenty paying mines with a combined production of about 60,000 ounces of gold per month. They are operating 480 stamps. The firm of Bewick, Moreing & Co. consists of C. A. Moreing, H. C. Hoover and T. W. Wellsted.

Leonora, W. A., Feb. 19.

BRITISH COLUMBIA.

(Special Correspondence).—Velvet shipments from Jan. 1 to March 25, 1903, show: 2075 tons dry ore, 1507.16 ounces gold, 1867.4 ounces silver, 147,933 pounds copper. Net returns from smelter, \$30,389.91.

Rossland, April 10.

The Rossland Miner says the condition of the Coal Creek mines, near Fernie, is such that shipments have resumed in small quantities, but it will be some time before the mines are in full operation. The "high line" of No. 2 is the only place as yet workable. The lower levels of No. 2 have not been fully repaired since the explosion, and this work will be continued. No. 1 is in shape and is shipping. In No. 3 a long delay will follow. The company was making successful efforts to keep it pumped during the strike, but owing to the interference of the mob the pumps were stopped and became frozen up. It is estimated it will take three weeks to pump it out and repairs made.

The name of the Kettle river mining division has been changed to that of the Greenwood mining division, to take effect May 1.

Returns received by the Providence M. Co. of Greenwood for a car of ore sent to the smelter last week showed twenty-two tons; gross value, \$161.49 per ton; net returns, \$155.05 per ton. The assays gave: Gold, 2.17 ounces; silver, 265.2 ounces, and lead, 6%.

The Payne mine at Sandon is grading and cribbing the site for the zinc roaster. The mill is running steadily turning out fifteen tons daily of lead and zinc concentrates. The ore shoot struck on the No. 8 level has been opened up for 130 feet, showing a shipping grade all the way.

Carpenters are framing timbers for the Nickel Plate mill at Okanagan.

A 5-drill compressor will be put in at the Seattle claim, north fork of Kettle river, near Phoenix, and under bond to the Trail Smelter Co. R. H. Hutchens is superintendent. It is the intention to quarry the ore of the lower grade, of which there is a large outcropping, and which can be gotten out cheaply, and the higher grade of ore taken out in course of development work will be shipped. It is reported ore was found on the Seattle last week showing 25 feet, running \$40 per ton.

The recent cold snap enabled a number of Fraser river placer miners to work a larger portion of the gravels in the exposed bed. The intense cold and the continued frost caked the smaller streams into ice so that they ceased to flow. This made the Fraser unusually low, and Indians and Chinese who live in the region from Yale to Lillooet washed out gold while the frost lasted. W. Dodd, government agent at Yale, says rich placer diggings were discovered last week on a low water bar on the north shore of the Fraser river, opposite Yale, known as Sawmill Riffle. Companies are washing from \$15 to \$70 a day to the rocker.

It is reported the Emma mine, at Summit, in the Boundary district, which has been shipping steadily to the smelters, the ore being used largely as a flux, will discontinue shipping for a time, but development work will continue.

At the Velvet mine, near Rossland, shipments to Le Roi smelter have been temporarily suspended, due to the condi-

tion of the wagon road to the Red Mountain railroad. Meantime stoping is being continued and the ore extracted stored. Development will be increased.

MEXICO.

DURANGO.

The mines of the Vacas-Quebradillas Junction M. Co., near Quebradillas, are shipping high-grade ore to the Monterey smelters. E. Williams is general manager.

MORELOS.

The Trinidad M. & S. Co. are packing in from Iguala sixty-six tons of machinery 60 miles to their mines in the district of Aldama. There are 3600 tons of ore on the dumps, which averages two-thirds of an ounce of gold per ton, of which 96% can be recovered by the cyanide process.

OAXACA.

In Tavicke district, near Ocatlan, the Tavicke M. & M. Co. expects to have its mill completed and running by May 15. It is an amalgamation and concentration plant of 100 tons daily capacity. The ore carries gold and silver.

SONORA.

(Special Correspondence).—The Gold Coin P. & D. Co., at San Javier, is operating the Gold Coin Meza Mexicana at Meza, where the ore runs from .40 to .60 ounces in silver, 6% to 11% copper and some gold. The ore bodies are over 50 feet wide. They will install a new plant of machinery, consisting of hoist, boiler and water jacket smelter. The same company is operating the Santa Rosa and Tosta at San Javier. The main shaft is down 250 feet, with drifts at each level. They are doing development work preparatory to shipping ore to the smelter at Toledo. The company is composed of metallurgists, mining engineers and machinists, backed by Boston men. The party drove through from Colorado Springs, Colo., prospecting on the way, and finally located at San Javier. L. Ginger is manager, John Moy assistant manager.

The Wyman M. Co., operating the Las Animas mine, will erect a concentrating mill and hoisting plant. One shaft is 300 feet deep, one 150 feet and one 220 feet. They are doing development work. The ore runs from 100 to 150 ounces in silver and 8 to 10 ounces in gold. G. Wyman is manager, L. C. Wyman assistant manager, J. Miller superintendent.

San Javier, March 23.

(Special Correspondence).—T. S. Lamberson has five claims in the district of Montezuma, south of Douglas, Ariz., which he is developing. One of the veins is 15 feet wide and runs high in silver, with one ounce gold. One of the claims adjoins the Lucky Tiger, sold recently for a large amount.

Montezuma, April 1.

It is reported that the Greene Con. Co. at Cananea, W. C. Greene president, will build a factory near their smelter for the manufacture of copper and tin ware.

TABASCO.

F. N. Lister, secretary of the Tabasco Oil Co., says drilling operations are under way in the oil fields of Macuspansa.

The La Luz G. M. Co. report for nine and one-half tons of ore from the La Luz mine at Maguarichic, shipped last week, a net return of \$6326 from the smelter.

W. C. Rollins, manager of the Buenos Aires M. Co., says he has completed the Huntington mill at Cusihuiriachic. The process is pan amalgamation and settling tanks are used. The ore is said to be free milling silver, running 300 ounces per ton.

Obituary.

S. MORGAN SMITH, president S. Morgan Smith Co. of York, Pa., and the Atlanta Light & Power Co. of Atlanta, Ga., died at Los Angeles, Cal., on the 12th inst., aged 64 years.

JAMES ROSS, a veteran prospector and mining man, died on the 5th inst. at Sumpter, Or., of paralysis, aged 60. Deceased was born at Sherbrooke, Canada, and was a Confederate veteran of the Civil War.

T. W. POINDEXTER, a pioneer mining man of California and Canyon City, Or., died on the 10th inst. at Dillon, Mont. Deceased was born in Danville, Va., March 27, 1829. He was at one time mayor of Dillon, and leaves a widow and five sons.

P. EICHELROTH, superintendent of the Fricott & Miller mine, near Latrobe, El Dorado Co., Cal., was killed April 10th, having accidentally shot himself with a 22-caliber rifle while riding in a cart near Michigan Bar. Deceased was a graduate of the University of California.

PERSONAL.

G. S. HOLMES of Salt Lake City, Utah, is in New York.

C. R. BROWN has returned to Nogales, Ariz., from Kansas.

J. M. LESZYNSKY of Denver, Colo., is in San Francisco, Cal.

R. J. PROVINIS of Grass Valley, Cal., is in San Francisco, Cal.

F. MCNAMEE is in Salt Lake City, Utah, from De Lamar, Nev.

P. E. C. BURK, of Cripple Creek, Colo., is examining mines at Alamo, Or.

S. MCGIBBON, a mine owner of Elk City, Idaho, is in Spokane, Wash.

N. TREWEEK of Salt Lake City, Utah, is taking a trip through California.

J. S. CAIN of Bodie, Cal., is in San Francisco, Cal., on mining business.

W. CABLE returned last week to Sumpter, Or., from an extended trip East.

D. FALCONER is superintendent of the Annie Laurie mine, near Colfax, Cal.

M. M. ESTY, of Leadville, Colo., is examining mines in Tonopah district, Nev.

P. V. MOLSON has returned from British Columbia to Salt Lake City, Utah.

MAURICE WALKER will represent the Pacific Steel & Wire Co. in Portland, Or.

G. W. MAYNARD of New York is examining mining property at Idaho City, Idaho.

WM. T. MACDONALD goes from Los Angeles, Cal., to Chimpas, Chihuahua, Mexico.

OWEN BYRNES, manager of the Empire mine, Marysville, Mont., is in Chicago, Ill.

J. M. THOMAS of the Fremont-Vineta M. Co. at Breckenridge, Colo., is in Chicago, Ill.

W. J. NELSON, a mine owner at Mojave and San Andreas, Cal., is in San Francisco, Cal.

J. R. LUCUS of the Good Hope M. Co. at Phillipsburg, Mont., is visiting at St. Louis, Mo.

T. A. BROWN is in San Francisco from Manvel, San Bernardino Co., Cal., on mining business.

E. M. BARTON of Welser, Idaho, is examining mining property near Winnemucca, Nev.

J. C. MOORMAN, secretary of the Yaqui S. & R. Co., Hermosillo, Mexico, is in Toledo, Ohio.

D. C. ROBBINS of Salt Lake City, Utah, is examining mines at Marysville, Plute county, Utah.

P. S. BATES, publisher Pacific Miner, is in San Francisco, Cal., on his return from the East.

G. MCM. ROSS, a mining superintendent at Virginia City, Nev., is in San Francisco, Cal.

H. W. TURNER, superintendent Cherry Hill mine, near Yreka, Cal., is in San Francisco, Cal.

J. J. MCSORLEY of San Andreas, Calaveras Co., Cal., is in San Francisco on mining business.

T. J. GRIER, superintendent of the Homestake G. M. Co., Lead, S. D., is in New York City.

F. L. MASON is superintendent of the Standard mine at Deadman's Flat, near Nevada City, Cal.

R. A. JACKSON, manager of the Atlin Lake M. Co., is in Vancouver, B. C., from Skaguay, Alaska.

H. L. MILLS of the Wedge mine on Bullion creek, near Marysville, Utah, is in Salt Lake City, Utah.

MANAGER J. T. HODSON has returned to the Lincoln mine at Pearl, Idaho, from Salt Lake City, Utah.

W. L. MOBLEY of North Bloomfield, Nevada county, Cal., is in San Francisco, Cal., on mining business.

A. R. MERRITT of Duluth, Minn., president Success M. Co., operating near Milford, Utah, is in Milford.

H. L. FRANK, owning coal properties at Frank, Alberta, Canada, has gone to Paris, France, on business.

E. W. WILLIAMS of Denver, Colo., operating a group of mines near Idaho Springs, Colo., is in the East.

H. M. RALSTON of Chicago, Ill., vice-president of the Lion G. M. Co., has re-

turned from a visit to their mines on Cherry creek, near Prescott, Ariz.

E. P. JENNEY, superintendent of the Bamberger-De Lamar mill at De Lamar, Nev., is in Salt Lake City, Utah.

ASSISTANT MANAGER S. T. GODBE of Bamberger's De Lamar mines is in Nevada from Salt Lake City, Utah.

W. J. HUPP of Weaverville, Cal., interested in mines in Siskiyou county, is in San Francisco, Cal., on business.

M. F. MURRAY of Salt Lake City, Utah, of the Franklin M. Co., is examining mining property at Marysville, Utah.

SUPERINTENDENT WASSON of the Silver Peak mines, at Silver Peak, Nev., returned last week from Reno, Nev.

W. C. OCHS has returned to Salt Lake City, Utah, after making an examination of mining property at Eureka, Nev.

W. W. KIRBY has returned to Cripple Creek, Colo., from a four months' trip through the East on mining business.

E. W. MUELLER, manager of the Sumpter Smelter Co., Sumpter, Or., is in Seattle, Wash., on a business trip.

M. B. SKINNER, secretary of the J. McCrea Co., Chicago, Ill., is in San Francisco, Cal., on business of his company.

M. W. MATHER, superintendent of the Plumbago mine, south of Alleghany, Sierra county, Cal., is in Oakland, Cal.

L. C. TRENT returned to Salt Lake City, Utah, last week from an examination of mining properties at Pioche, Nev.

J. OBERNDORFER has returned to Salt Lake City, Utah, after an absence of several weeks in the East on mining business.

MANAGER H. S. JOSEPH of the Carls mine at Eureka, Utah, has returned to Salt Lake City, Utah, from Denver, Colo.

H. BROWN of Duluth, Minn., treasurer Success M. Co., operating near Milford, Utah, is in Spokane, Wash., from Milford, Utah.

MANAGER C. W. WHITLEY of the American S. & R. Co. is in Montana on mining business from Salt Lake City, Utah.

J. J. DALY, manager of the Daly-Judge mine at Park City, Utah, returned last week to Salt Lake City, Utah, from California.

J. H. HAMMOND, consulting engineer for Stratton's Independence, Ltd., Cripple Creek, Colo., is examining mines in Mexico.

W. J. SUTHERLAND, formerly superintendent of the Holmes mine, Candelaria, Nev., is in London, England, on mining business.

C. JARVIN AND C. HOFFMAN have returned to San Francisco from an examination of mining properties near Nevada City, Cal.

SUPERINTENDENT G. A. WHITEFORD of the Norwegian mine, near Tuttle town, Tuolumne county, Cal., is in San Francisco, Cal.

C. A. HOLLAND of Carters, Tuolumne county, Cal., superintendent of the Starr King and Altadena mines, is in San Francisco, Cal.

W. B. HOGGATT, manager of the Jualin mine at Berner's Bay, on Lynn canal, below Skagway, Alaska, has returned from a trip East.

H. G. HEFFRON has resigned as manager of the ore purchasing department of the Bingham Con. M. Co., and will go to New Mexico.

MANAGER E. B. KIRBY of the War Eagle and Center Star mines, at Rossland, B. C., is in San Francisco, Cal., on company business.

F. LONGMAID of Oakland, Cal., has been appointed superintendent of the Velardena M. & S. Co., Velardena, Durango, Mexico.

MARTIN J. HELLER, of San Francisco, Cal., is general manager of J. R. De Lamar's mines, near Tucson, Ariz., succeeding H. A. Cohen.

MANAGING DIRECTOR E. O. LEE of the Dexter-Tuscarora of Tuscarora, Nev., has returned to Salt Lake City, Utah, from a visit to the mines.

A. J. MCMILLAN, managing director of the Le Roi and Snowshoe Mining Companies, has arrived in Rossland, B. C., from London, England.

N. GRATZ, manager of the Union Gold Dredging Co., near Centerville, Idaho, returned last week after a two weeks' visit in Boise, Idaho.

J. W. NEILL, superintendent of the metallurgical department for the Tintic M. & D. Co., Yampa smelter, at Bingham,

Utah, returned this week to Salt Lake City, Utah, from a trip East.

A. P. GARRETT of Boise, Idaho, is superintendent of the Nettle L. mine, near Loomis, Okanogan county, Wash., vice B. Crilly, resigned.

W. B. FISHER has resigned as general manager of the American Zinc, Lead & Smelting Co. of Carthage, Mo., and has gone to Colorado Springs, Colo.

A. BURCH of the Cœur d'Alene Development Co. has returned to Seattle, Wash., from a two months' trip through the Southern States and Cuba.

W. H. THOMAS of New York, part owner of the British Columbia C. Co., operating the Mother Lode mine and smelter at Greenwood, B. C., is at Greenwood.

W. MERTON, E. SCHROEDER of New York and L. G. Ronand, of East Orange, N. J., of the Resurrection Mill Co. at Leadville, Colo., are in Leadville, Colo.

E. BRUNKHORST, cyanide and mill man at the North Pole mine, near Sumpter, Or., has gone to Kalama, Wash., to assume management of the Darnell M. & M. Co.

W. H. DUNLAP, manager and superintendent of the Le Compton M. Co., near Nevada City, Cal., returned last week from a business trip to Virginia City, Nev.

S. T. GODBE, A. H. GODBE AND H. A. SMITH returned last week to Salt Lake City, Utah, from Neal district, Idaho, from an examination of mining properties.

D. L. KILLEN, president of the Killen-Warner-Stewart M. Co., at Sumpter, Or., returned last week from a three weeks' business trip to New York and Boston.

PRESIDENT STEVENS of the Siskiyou M. & D. Co. at Yreka, Cal., is managing director vice B. Cardwell resigned, and H. Williams is superintendent of the same company.

J. H. LOBEL, American director of the Societe Belgo-Americaine des Petroles du Wyoming, is in Cheyenne, Wyo., and has assumed charge of their operations in that State.

W. J. SHARWOOD of Berkeley, Cal., leaves on the 20th inst. for Marysville, Mont., where for several years past he has had the superintendency of the cyanide plant at the Drum Lummon mine. He goes to resume operations which are discontinued during the winter months.

Commercial Paragraphs.

THE Tri-Bullion Smelting & Refining Co. of Arizona has opened offices in Chicago at 307 Fort Dearborn Building.

PAWLING & HARNISCHFEGGER of Milwaukee, Wis., wire that the recent fire was confined to one building, in no way incommencing them, and that there is no delay in filling orders.

ADAM SCHILLING SONS, 211-213 Main street, San Francisco, manufacturers of the Golden Gate gas engines, ship this week a 30 H. P. distillate hoisting outfit to the Karma M. Co., near Mohave. It is intended to raise ore from a depth of 500 feet.

THE Elaterite Roofing Co. of San Francisco, Cal., report shipping this week to Hongkong, China, a large consignment of their elaterite flooring material to be used in covering warehouse floors, preventing mold and dampness, as the buildings are erected on the water front.

THE Krogh Mfg. Co., 519 Market St., San Francisco, Cal., has completed four large centrifugal pumps for shipment to Texas, for the irrigation of rice fields; capacity, 50,000 gallons per minute; guaranteed efficiency equivalent to 80%. The pumps weigh thirty tons each.

A FINE LIST of users of cranes and hoists made and sold by Pawling & Harnischfeger, Milwaukee, Wis., shows that representative concerns to the number of nearly 1000 have them in use. The folder, which gives detailed information as to type and capacity, will be sent to any address.

AN examination will be held at San Francisco, Cal., May 6, 1903, for the position of assayer. The appointee must show a broad technical training and wide experience in the work of assaying and metallurgy. Age limit, 20 years or over. Salary, \$2200 per annum. Competitors should apply either to the United States Civil Service Commission, Washington, D. C., or to the secretary of the Consolidated Board of Civil Service Examiners, 301 Jackson St., San Francisco, Cal., for application forms 304 and 375, which

should be properly executed and filed with the Commission at Washington. In applying for this examination the exact title should be used.

THE San Francisco & San Joaquin Coal Co. of San Francisco, Cal., has decided to install machinery for the briquetting of coal dust. The briquetting presses will be driven by electric motors arranged to give any desired speed from 20 R. P. M. to 550 R. P. M. in about fifteen steps. Two 40 H. P., slow speed, 500-volt, direct current motors have recently been purchased for this purpose from the Westinghouse Electric & Mfg. Co., together with speed controlling rheostats designed to vary the speed of the motors within the above limits. The controllers will allow the motors to be operated continuously at any of the speeds.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING APRIL 7, 1903.

- 724,540.—CONVEYOR—H. E. Brett, Los Angeles, Cal.
- 724,661.—FEED WATER HEATER—A. de Bretteville, S. F.
- 724,706.—BOTTLE CRATE—W. E. Brown, Los Angeles, Cal.
- 724,797.—BOTTLE CRATE—W. E. Brown, Los Angeles, Cal.
- 724,429.—MOTOR—A. Brunnelle, No. Yakima, Wash.
- 724,799.—WINDOW CLEANING CHAIR—C. Buckel, S. F.
- 724,991.—TRUCK—F. E. Caton, San Jose, Cal.
- 724,663.—ELEVATOR—M. A. Clennam, S. F.
- 724,443.—BOTTLE—J. M. Culp, Cottagegrove, Or.
- 724,824.—MEAT CHOPPER—R. Dettmer, Oakl. nd, Cal.
- 724,835.—HEN'S NEST—W. J. Dillard, Santa Rosa, Cal.
- 724,678.—NOZZLE—W. A. Dohle, S. F.
- 724,844.—SCHOOL DESK—Gilson & Rowe, Oakland, Cal.
- 724,692.—OIL DISTRIBUTOR—J. B. Glover, Redlands, Cal.
- 724,573.—PILING—Hurling & Bauer, Seattle, Wash.
- 724,531.—QUICKSILVER ROASTER—Johnson & McKay, S. F.
- 724,899.—LOCK—A. W. Livingston, Alameda, Cal.
- 724,905.—TABLE—M. Manfred, Santa Barbara, Cal.
- 725,004.—WHIP—H. F. Moore, Ventura, Cal.
- 724,487.—BATH TUB—A. Moorefield, Stockton, Cal.
- 724,488.—PROPELLER—R. Murr, Seattle, Wash.
- 724,728.—OIL BURNER—E. I. Nichols, S. F.
- 724,933.—GATE—F. L. Price, Hoskins, Or.
- 724,967.—FEED WATER HEATER—C. O. Taylor, Farmington, Wash.
- 724,761.—OIL BURNER—Van Pelt & Laufman, Oakland, Cal.
- 724,527.—VALVE—I. G. Waterman, Santa Barbara, Cal.
- 724,528.—VALVE—I. G. Waterman, Santa Barbara, Cal.
- 724,765.—SPEED GOVERNOR—White & Duryea, Los Angeles, Cal.
- 724,768.—MEASURING APPARATUS—A. C. Wright, Berkeley, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

ELEVATOR DRIVING MECHANISM.—No. 724,663. April 7, 1903. M. A. Clennam, of San Francisco, Cal. One-half assigned to Cahill & Hall Elevator Co., of San Francisco, Cal., a corporation. This invention is especially designed to provide a differently acting driving mechanism by which the speed of the apparatus is varied and reversed without change in the direction of rotation of the motors. It consists in a driving mechanism of primary and secondary gears of different diameters coaxial with each other and revolvable about a common axis, a shaft axially in line with said gears and having an eccentric portion, an intermediate gear turnable upon said eccentric portion, said intermediate gear being in mesh with the primary and secondary gears and serving to transmit motion, and an independent driver by which the primary gear may be revolved about its axis. It is especially valuable as applied to elevators, hoists of all descriptions, and in itself provides a sufficient brake to prevent any accident from the running away of the machinery, as the hoisting drum will remain stationary and locked by the gears at any point at which it may be left.

SCHOOL DESK FRAME AND ATTACHMENT THEREFOR.—No. 724,844. April 7, 1903. J. C. Gilson and D. E. Rowe, of Oakland, Cal. This invention consists in the combination with a desk of a plate having means to interlock with the side standard of the desk and having projecting from the outer side of its upper end spaced horizontal and vertical flanges and having on said outer face below said flanges a vertical series of trough-shaped ledges of different lengths cut away at the central portions, and a projecting box-like receptacle on the lower portion of the plate. By means of this invention the pen-holders, pencils, ruler, sponge, etc., of the pupil may be kept always convenient for use.

SAFETY CHAIR FOR WINDOW CLEANING.—No. 724,799. April 7, 1903. C. Buckel, San Francisco, Cal. This invention is especially designed for use where it is necessary for persons to sit or stand outside of the window for cleaning and like purposes. It consists of a light portable frame with means for attaching it to the window sill, so as to project outside, means for securely locking the seat in place, and means for adjusting it with relation to the inclination of the window sill and also with relation to different widths of windows upon which it may be applied.

Latest Market Reports.

SAN FRANCISCO, April 17, 1903.

METALS.

SILVER.—Per oz., Troy: London, 23½d (standard ounce, 925 fine); New York, bar silver, 49½c, refined (1000 fine); San Francisco, 50c; Mexican dollars, 38 @39c San Francisco, 39c New York.

The present rise in silver is attributable to the purchase by the Government of large amounts for Philippine coinage. Whatever the cause, the slightly increased price is none the less welcome to producers of the metal.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$15.00@15.25; Electrolytic, 1 to 3 casks, \$15.00@15.25; Casting, 1 to 3 casks, \$14.50@14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £63 spot per ton.

The German consumption of foreign copper for January and February, 1903, is here compared, in tons, with the same period of 1902 and 1901:

	1903.	1902.	1901.
Imports	12,504	9,705	11,207
Exports	1,725	1,482	1,398

Consumption 10,779 8,223 9,889

LEAD.—New York, \$4 67½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £13 15s per long ton—2.75c per lb.

SPELTER.—New York, \$5.70; St. Louis, \$4.60; London, £22 10s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$29.65@29.80; San Francisco, ton lots, 3½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33c; bar tin, 3½c, 35c @37½c. London, £135 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 @oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$45.50@46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 3½c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17.15c.

NICKEL.—New York, 50@60c @ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.35; gray forge, \$20.50; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer	\$23.50@24.50
Foundry Northern 1	23.00@24.00
Northern 2	22.50@23.50
Northern 3	22.00@23.00
Southern 1	22.85@23.35
Southern 2	22.35@22.85
Southern 3	21.85@22.35
Forge	21.35@21.85
Charcoal	26.00@27.00
Billets, Bessemer	33.00@34.00
Bars, iron	1.85@ 1.99
Bars, steel	1.75@ 1.80
Rails, standard	28.00@30.00
Rails, light	34.00@40.00
Plates, boiler	1.90@ 2.00
Tank	1.75@ 1.90
Sheets, 26 store	2.90@ 3.00
No. 27	3.00@ 3.10
No. 28	3.10@ 3.20
Angles	1.75@ —
Beams	1.75@ —
Tees	1.80@ —
Zees	1.75@ —
Channels	1.75@ —
Steel melting scrap	18.50@19.00
No. 1 railroad wrought	20.00@20.50
No. 1 cast, net ton	18.50@19.00
Iron rails	24.00@25.00
Car wheels	24.00@24.50
Cast borings	10.50@11.00
Turnings	14.50@15.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.35; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60;

3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2*, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2 50 @ 2.75; Hemmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50@55c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c @ lb.; carloads, 23@24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½@2½c @ lb.; caustic soda, in drums, 3@4c @ lb.; Cal. s. soda, bbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chloride of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb tins; borax concentrated, 7@8c @ lb.; roll sulphur, 4@6c; powdered sulphur, 2@3c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2@2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5@7c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66½c, B. 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb powdered, 9@12c; fused, 25@30c.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4c @ lb.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5@7c.

MANGANESE.—Pure, 5c @ lb., 60c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

SODIUM.—Metal, 3c @ lb., \$1.00.

MERCURY.—Bichloride, 3c @ lb., 90c.

PHOSPHORUS.—(American) 3c @ lb., 75c.

SILVER.—Chloride, 3c @ oz., 90c@1.00; nitrate, 55c.

URANIUM.—Oxide, 3c @ lb., \$3.50.

ZINC.—Metallic, chemically pure, 3c @ lb., 50c; dust, 3c @ lb., 10c; sulphate, 3c @ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Annual Meeting.

The Regular Annual Meeting of the Stockholders of the GWIN MINE DEVELOPMENT COMPANY will be held at the offices of the Company, Nos. 1208-11 Claus Spreckels Building, San Francisco, California, on **TUESDAY**, the 26th day of April, 1903, at the hour of 2 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the Meeting.

Transfer Books will close on **SAURDAY**, the 25th day of April, 1903, at 12 o'clock noon.

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WANTED.

Metallurgist and Smelter is open for engagement to take charge of copper property. Thoroughly experienced in mining and treating low grade ores. Position preferred in Latin America. At assayer and analyst, age 35, single, excellent references. Address "Cobre," care of Mining and Scientific Press.

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COMPETENT MILLMAN, MACHINIST AND Chemist. Experience free mill and concentrating. College education. Have built and operated mill in Montana for 13 years. Competent accountant and able to administer affairs of a company. Would like situation with a company out of a promoter's hands. References the best. Address H., care of this office.

CYANIDE, MILL OR AS ASSISTANT GENERAL Superintendent. A thorough chemist and assayer. Technical graduate. Treatment of low grade ores a specialty, also construction. Understand Spanish. Will go anywhere. References A1. Address "Competent," care of this office.

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MINING SUPERINTENDENT, FOURTEEN years' successful experience in management of mines, with best of references, desires situation. Address N. F., this office.

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WANTED.

WANTED—MILL TAILINGS, Gold, silver or lead, in New Mexico, Arizona or old Mexico. Will buy or lease. Give location, quantity and value. A. E. VAN VELSAN, Telluride, Colorado. Box 131.

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FOR SALE—Cyanide Plant,

Experimental, never used, consisting of 2 8x4 ft. Leaching Tanks (3-16 in) with Filter Bottoms and Filters; 1 Solution Tank 5x6 ft. (No. 12); Zinc Boxes; 10 Zinc Box Screens; 1 Rotary Pump; 1 4 Gal. Iron Mortar with Pest; 1 Rotary Assay Furnace (Hoskins); Pipe, Valves, Ellis, Nipples, Rope, Hose and Clips. Presently stored in Denver. Will sell cheap. Apply JOHN A. NELSON, McPhee Building, Denver, Colorado.

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Force of Nitro Powder Explosions.

The question is again being agitated as to the direction of the explosive force of powder, and particularly of nitro powder. The theory generally accepted is that the explosive force is exerted equally in every direction. This is a theory based on rational

with it and it will accomplish the same result. The miner loads "down" holes and "uppers" of given diameter and depth of hole with the same amount of powder, all other conditions being equal, and the rock is broken with approximately similar results. In fact, large experience in blasting operations has not shown that the explosive force of powder, confined or unconfined, is not exerted equally in all directions. It is simply made evident in any particular direction by the resistance it overcomes, but where the resistance is stronger than the force of the powder there is no fracture. Often in mines the base

the hardness and the tenacity of the rock is superior to the explosive force of the powder, which has expended its force without material result. In such instances the collar of the hole is first blown off, and successive charges fracture the rock until it is finally rendered incapable of further resisting the explosive force, when the rock is blasted out. The tendency of this explosive force in powder, as exemplified in blasting operations, is to break rock at an angle of 90° to the direction of the drill hole, but it often fails to do this, owing to conditions of resistance within the rock. Learning this by experience, the miner selects the point to start the drill hole, and gives it a direction calculated to insure the best results.



Gravity Tramway and Mill, Cherry Hill Mine, Siskiyou County, Cal. (See Page 262.)



Entrance Cross-Cut Tunnel, Cherry Hill Mine, Siskiyou County, Cal. (See Page 262.)

conclusions. It would seem impossible that it could be otherwise, but actual practice should give the best idea of this. It has long been known that a stick, or portion of a stick, of nitro powder placed on the top of a rock or boulder will break the rock into fragments if the amount of powder is large enough. The downward force of the explosion is evidenced in the breaking of the rock, but the upward explosive force is not shown, as it is wasted upon the air where there is the least resistance. Place the stick beneath the rock and in immediate contact

of a drill hole that has been exploded with nitro powder is found to contain a mass of powdered rock but no fracture has resulted beyond the bottom of the hole, although all of the rock, from the bottom of the hole outward, has been blasted away. The force in this case has been exerted equally in all directions, but was incapable of breaking beyond the limits of the drill hole. It is not an uncommon thing to see a drill hole driven directly into a face of hard rock for 5 or 6 feet, loaded with nitro powder, and fired repeatedly before the rock is broken, for the reason that

Each hand-drilled hole is put in with definite purpose, to accomplish some certain result.

Machine drill holes are put in with almost systematic precision, dependence being placed on general results rather than distribution of the holes with reference to their particular capacity to break rock. For this reason hand work is sometimes to be preferred to machine drilling, and in shaft work is often superior. A knowledge of blasting and of the effect of the explosive force of nitro powder can best be attained by practical experience.



Picacho Basin, San Diego County, Cal. (See Page 260.)



Dismantled Pumping Works, Picacho, Cal. (See Page 260.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Gravity Tramway and Mill, Cherry Hill Mine, Siskiyou Co., Cal.	257
Entrance Crosscut Tunnel, Cherry Hill Mine, Siskiyou Co., Cal.	257
Picacho Basin, San Diego Co., Cal.	257
Dismantled Pumping Works, Picacho, Cal.	257
Hints on Leather Belting.	261
Krom Cushioned Rolls.	262
Quartz Mill at Bendigo, Australia, Showing Construction.	263
Battery of the South New Moon Co., Bendigo, Australia.	264
Water Hoisting in the Anthracite Region.	265
Mining and Metallurgical Patents.	267
EDITORIAL:	
Force of Nitro Powder Explosions	257
Age of Gold in Mines.	258
The Strike in Amador and Calaveras Counties.	258
Character of Hoisting Plants.	258
MINING SUMMARY.	268-269-270-271-272-273
LATEST MARKET REPORTS.	273
MISCELLANEOUS:	
Concentrates.	259
Copper Production on Lake Superior.	260
Topographic Mapping of Arizona, 1903.	260
The Picacho Basin Mines.	260
Hints on Leather Belting.	261
Mines of Cherry Creek, Siskiyou Co., Cal.	262
Use of Hydrogen Peroxide in Volumetric Analysis.	262
Krom Cushioned Rolls.	262
Gems in the United States.	262
Chambered Veins.	262
The Yak Tunnel.	262
Gold Milling Practice in Bendigo.	263
The Elmore Process.	264
A Prospector's View.	264
Hot Blast in Pyritic Smelting.	264
Water Hoisting in the Anthracite Region.	265
Milling at the Camp Bird, Colo.	266
Mining and Metallurgical Patents.	267
Personal.	273
Obituary.	273
Catalogues Received.	273
Commercial Paragraphs.	273
New Patents.	273
Notices of Recent Patents.	273

Age of Gold in Mines.

A quasi-scientific article entitled "The Age of the Homestake Lode, South Dakota," which recently appeared in a current publication, is subject to criticism, as it contains statements not sustained by actual facts. Dr. F. R. Carpenter, in his paper "Ore Deposits of the Black Hills of Dakota," is correct when he says "the conglomerate being gold-bearing, absolutely proves the gold in the Homestake mines to be of Archæan age."

It is not always possible to determine, even approximately, the geological age of the gold found in mines, as the time is at best only relative, being determined by a comparison of geological conditions with some other formation or locality. The formation of some veins and the introduction of their metallic contents in many instances, however, can be definitely determined to the extent, at least, of fixing their age as not being older than a stated time. The veins of Cripple Creek, Colo., although occurring in both granite and andesite, are known to be of comparatively late formation, probably later than the Cretaceous. The ore deposits of Leadville, Colo., are so intimately associated with the intrusive rocks of that region that it is believed they originated subsequent to the intrusion of these rocks which occurred about the close of the Cretaceous, though the limestones are of Carboniferous and the lower quartzites of Cambrian age.

The gold-bearing veins of the California gold belt are not older than the Jurassic, as they occur in rocks of that age, but are probably of Cretaceous age. The silver deposits of Calico district, Cal., are probably of Tertiary age, as the Tertiary beds of the vicinity were raised by the uplift of the older rhyolite tuffs and breccias at the time of the intrusion of rhyolite dikes, and the general dynamic disturbance which fractured the rock masses and resulted in the formation of zones of crushing, open fissures, etc., which were subsequently filled by infiltrations chiefly of baryta with silver (presumably as sulphide, but which was later changed to chloride).

The gold in the gold-bearing veins (not blanket de-

posits) of the Black Hills of South Dakota are undoubtedly for the most part of Archæan age. Throughout the area of the older crystalline rocks in the Hills determined as Archæan, or, at all events, not later than Algonkian, gold occurs in veins, or as lenses in the schists. In many instances gold is not present in payable quantity, but it is there in appreciable amount. It is not improbable that some of the gold may have been introduced in later time than Archæan, but there are several localities where there is indisputable evidence that the gold in the Archæan rocks is older than the Cambrian. About Lead City and Central City and at Terraville this is clearly shown in the fact that the Cambrian conglomerate, which immediately overlies the upturned Archæan schists, in which the mines of the Homestake group chiefly occur, is auriferous—in fact, an ancient placer deposit, formed by the disintegration of the upturned edges of the schists together with their contained gold, and the deposition of the resulting water-worn pebbles, together with the smooth flakes and nuggets of gold abraded by the shifting currents and wave action on the shore of a Cambrian sea. In the Hidden Treasure mine at Central City, in 1877-78, it was no uncommon thing to see pieces of this conglomerate torn up from the bedrock (Archæan schist) by the picks of the miners, exposing from \$20 to \$100 or more in gold in the form of placer nuggets, adhering to the slab of cemented gravel. As it is impossible to have a placer mine without an older deposit of gold as a source of the gold in the placer, and as the gold-bearing conglomerate was undoubtedly a placer deposit on the Cambrian shore, it proves conclusively that the Archæan schists were gold-bearing in pre-Cambrian time.

The schists of this region are intruded in many places by dikes of light colored igneous rock which has been variously described by different petrographers as "felsite," "rhyolite," "grorudite," etc. The rock is usually fine grained, light ashy gray in color, with a slightly greenish cast, and on close examination with magnifying glass may be seen to contain finely disseminated iron sulphide. This rock is abundant in the Homestake, Highland, Caledonia and some of the other mines of the Homestake group, and is intimately associated with the ore bodies. That this rock had an enriching effect upon the ore bodies seems not improbable, but it is a notable fact that no fragments of this intrusive rock have ever been found in the bed of conglomerate overlying the Homestake mine or in its vicinity, which proves conclusively that the intrusion of the dike rock was later than the Cambrian. The northern Black Hills has been extensively intruded by dike rocks, and these in many instances have formed laccoliths, often local in extent, but perfect in form. They may be seen on Two-Bit gulch and Spruce gulch, east of Deadwood, and in the region south of Lead City, near Ruby basin; also on Squaw creek, west of Deadwood; near Boulder creek, north of Deadwood, and in the Terry peak region on a large scale. The intrusive rocks in and about the Homestake mine also formed laccoliths of considerable size, and it is this type of intrusion in connection with the later intrusive dikes that resulted in the formation of the extensive deposits of siliceous telluride ores in the regions extending from Galena on the east to Spearfish canyon on the west, and from the Homestake on the north to Terry's peak and Whitewood Divide on the south, but the age of these latter deposits is believed to be not older than the close of the Cretaceous. They have nothing in common with the Archæan zones of gold-bearing rock, are different in character, genesis and value.

DURING the past week there had been a hope that the miners' strike in Amador and Calaveras counties, Cal., would be settled, as there seemed to be a conciliatory disposition manifested on both sides. The executive committee of the Mine Operators' Association have proposed the following: Employees may return to work, union and non-union, and no discrimination against either. Where the time of the underground shift is now ten working hours, the same shall be reduced to nine working hours with the same rate of wages. The union is not to be recognized. To this the mine operators agreed, and miners at the Gwin mine also agreed, but Amador miners now ask for eight hours, declining to accept nine hours.

Character of Hoisting Plants.

When about to place a hoisting engine at a mine shaft there are a number of important factors which should be considered. First, the amount of material to be handled daily, the depth from which it is to be hoisted, the size and weight of the carrier—skip, car or bucket—and speed necessary to make a given number of trips with a stated load. Thus with a necessary output of 600 tons daily from a depth of 1000 feet, presuming skips are used, with capacity of two tons, in two-compartment shaft, running in balance. To hoist 600 tons at the rate of two tons per load would require 300 trips. If a skip can make the trip from the 1000 level to the surface in one minute, dump and return to the 1000 level and be filled in one minute and a half, this would require two and one-half minutes to make a round trip, but as the skip in the opposite compartment is supposed to be carrying ore at the same time, this results in the delivery of two tons at the surface, on an average each seventy-five seconds, or 300 loads in 6.25 hours. This permits all hoisting of ore to be done in the day time, and also allows abundant time for handling men, machines and materials, beside permitting the handling of all waste and extra work, water hoisting, etc., to be done on night shift.

In figuring horse power of engines required to do work as outlined, not only speed of hoisting and load of ore must be counted, but also weight of skip, maximum weight of rope and necessary allowance for frictional and other losses must be taken into consideration. Presuming that the skip weighs 2000 pounds, 1000 feet of 1½-inch rope weighs 2000 pounds, and the load of ore weighs 4000 pounds, this makes a gross load of 8000 pounds to be hoisted 1000 feet in one minute. The counterbalance of the empty skip descending in the opposite compartment, weighing 2000 pounds, decreases this maximum load to about 6000 pounds, but from the time of starting the relative loads are never constant, as while the empty skip descends the shaft, the weight of the rope constantly increases until at the 1000-foot level when the loaded skip has reached the surface weighing gross 6000 pounds, the empty skip has reached the bottom of the lift, and represents a counterweight of 4000 pounds. The hoisting engine must be capable, however, of starting the maximum load of 6000 pounds and lifting it at the rate of 1000 feet per minute, or 6,000,000 foot-pounds per minute. The theoretical power required would be about 181 H. P., but there are numerous factors to be considered in this connection. These are loss of efficiency in the engine (that is the difference between the indicated horse power and the actual horse power developed in the cylinders), the friction of the drum or reel, and sheave bearings; the stress of the rope, winding on the drum, and on the sheave in the head frame; the friction of the guides in the shaft and the resistance from air, which factor is seldom given the consideration it merits, as it is considerable and increases directly as the speed of running. All of these factors are variable and in well appointed plants are reduced as far as possible, by lubrication, and careful setting of machinery and proper construction, but a factor of 25% is always necessary, and in the case of inclined shafts, or where the difficulties and disadvantages are multiplied, a larger factor must be provided.

There is a tendency to economize on first cost, and in many instances, after an expensive hoisting plant has been installed to perform given service, as in the example given above, within a short time the engine is called upon to perform far more than was originally planned. This is done by increasing the load or the speed, or both, and carrying the mine workings to greater depth, and still demanding that the engine give the same service as was originally calculated. As in many instances the development and operation of the mine are carried beyond the original plans or expectations, the necessary provision should be made when first installing the permanent plant, for it is more economical to put in a plant which in first cost shall cover all probable extensions and exigencies than to build two such plants. It is not advisable to put in a large and costly hoisting plant for shaft sinking, as the amount of material to be removed in any case will not exceed 120 tons per day, and in most cases does not reach half of this amount. The extreme case does not require more than fifteen tons to be hoisted per hour during an eight-hour shift.

CONCENTRATES.

THE average declared value of imported cyanide of potassium the past year was 19½ cents per pound. About 2,500,000 pounds are annually imported. The duty is 12½% ad valorem.

THE amount of stripping economically possible in a gravel, drift or quartz mine depends entirely upon the value of the gravel or ore to be removed subsequent to stripping. In placer mines alluvial may often be cheaply removed by ground sluicing.

DOUBLE DISCHARGE MORTARS give large crushing capacity, but are not suited to an ore which requires amalgamation in the battery. They are chiefly employed in crushing ores for concentration, or for treatment by wet silver processes, as lixiviation, etc.

THERE are no extralateral rights in Mexican mines. The mineral rights of miners are defined by the boundary planes extended downward vertically to the center of the earth. Veins outcropping on adjacent claims which pass beneath the surface of an adjoining claim cease to be the property of the owner of the outcrop claim.

WHAT would constitute pay gravel in one district may not be considered equally good in another locality where the conditions were different. The character and depth of the gravel, amount of water available, or to contend with, grade of bedrock, rate of wages and cost of lumber; all have an important bearing on the economics of the enterprise.

HOISTING engines in very deep mines in a few instances run at a speed of 6000 feet per minute, but the ordinary speed is 1000 to 3000 feet per minute in most deep mines. In all of these large deep shafts the loads are heavy, ranging from two to ten tons. Such high speeds are only safely attainable in shafts 2000 feet or more in depth.

SPLIT spiling or lagging are generally considered superior to 2-inch plank, both for strength and durability. Sap lagging, however, is inferior to good plank. In shaft work, where it is not necessary to "drive" lagging, plank is preferred to the split lagging, and is more easily placed. In very loose ground double lagging is sometimes used.

A ROCKER may be made in sections for transportation on animals, sleds, or the backs of men. The sides, bottom and back end may be held securely in place by means of light iron (½-inch) bolts. A rocker of this description costs little more than one of the ordinary kind. Many thousands of dollars have been washed out in rockers made from shoe boxes.

THE mixing of low-grade ore, which in itself will not pay for metallurgical treatment, with high-grade ore to obtain large quantity should not be done, as the result is an actual loss of profit, which would result from a treatment of the high-grade ore alone. This is something that miners may sometimes do to get a "fair average," but in so doing deceive themselves.

THE hydraulic ram is a device employed where there is a considerable flow of water with a moderate fall, which by the use of the ram can be made to force a relatively small amount of water to a height greater than the fall. Rams are often used under the conditions stated to raise water to tanks for hoiler or domestic use where a large amount is not necessary.

MINERAL VEINS and mineralized zones usually occur most abundantly in those regions which have been subjected to the greatest disturbance. When ore deposits occur in sedimentary rocks which have apparently not been so disturbed, investigation usually results in the discovery of fractures, fissures and often the occurrence of intrusive dikes, the presence of which is not discernible upon superficial examination.

SOFT ground in a mine that upon becoming wet "runs," may best be handled by draining the water from the workings and keeping the level as dry as possible for a time before attempting to remove the ore, or to carry on development in the vein. When thoroughly drained, veins of this character are often worked without great difficulty, when an attempt to work them without previously allowing the ground to drain would be very difficult and expensive, if not impossible.

THE LAW requires the discovery of "mineral in place" to perfect a location, but this does not prohibit one from taking a claim and beginning work thereon in search of mineral. It is not necessary that the rock found shall be payable ore. "Mineral-bearing rock in place" are the words of the statute. A claim may be located and held on rock containing a fraction of a dollar per ton as well as on that which contains hundreds of dollars. The poor prospect may prove to be a bonanza upon development.

THE steam stamp has been employed successfully in amalgamation, but it is not in general use. The height

and rapidity of drop seem to have a direct influence on the percentage of amalgamation in the battery. A much more rapid drop is possible with a steam stamp than with the ordinary gravity drop stamp. With the latter 110 drops per minute is about the limit of speed that can be attained with safety and this can only be accomplished with short drop and short cams. A higher speed results in the tappet striking the cam.

THE United States production of molybdenum has risen from 10,000 pounds in 1898 to about 250,000 pounds in 1902. Consumption and production about keep pace. Molybdenite should contain 60% molybdenum to be marketable, and should be fairly free from phosphorus or copper. Its present greatest commercial importance is in manufacture of steel. The ore is quoted at prices corresponding to its shipping grade. The South Bethlehem Steel Co., South Bethlehem, Pa., are buyers. The process of reduction has been repeatedly published herein.

THE presence of tellurium in ores, when suspected, may be determined by boiling in concentrated sulphuric acid; when, if tellurium be present, a purple violet color appears, which fades upon further boiling. The color will be more or less intense, depending on the amount of tellurium present. Tellurium heated before the blow-pipe on charcoal gives a white coating with red or yellow border. If the fumes arising from the coal be caught on a porcelain dish the application of sulphuric acid will cause the grayish or brownish film to assume a crimson color.

AS a conductor of electricity, silver is superior to copper, the ratio being silver 1000, copper 931. Aluminum also possesses high conductivity, but to carry a given amount of electricity it should have a sectional area at least double that of copper. The melting point of copper is placed for convenience at 2000° F., which it approximates. It is impossible to fix exactly the melting point of substances requiring so high a degree of heat. When copper is heated to within 200° or 300° of its melting point it becomes very brittle, breaking readily, and may even be pulverized.

THE peculiar excellence of Lake Superior copper is due to melting the metal obtained directly from the ores by concentration where it occurs almost exclusively in the native state. This has resulted in placing a very high standard on American copper, and the metal when obtained by the various processes from other than those containing the native metal must be refined to a high degree to compete with Lake copper. The best fuel for refining copper is wood, owing to its freedom from sulphur and other impurities, which would have a deleterious effect on the metal.

LARGE GOLD MILLS having a double row of batteries are constructed usually with the batteries back to back, the overhead ore bins being arranged along the center of the mill. Very few mills are built on a different plan. The original 100-stamp mill at the Father De Smet mine at Central City, S. D., one of the Homestake group, had two rows of batteries facing each other, the bins being arranged along the center of the mill and sloping to the sides. It gave large bin capacity, but made a dark mill. It is an arrangement not in general favor. A well lighted mill is always desirable.

BY pyritic smelting is meant the complete fusion of sulphide ores by means of the heat generated by their own oxidation, and without the aid or addition of extraneous heat, such as carbonaceous fuel or the employment of the electric arc. The collection of the precious metals by employment of the sulphides is properly matte smelting, where no use is intentionally made of the heat generated by the oxidation of the sulphides. In pyritic smelting, as now practiced in successful plants, a hot blast is employed, which is really an extraneous heat. The hot blast is said to produce a beneficial effect in smelting which is greatly out of proportion to the heat units it supplies to the operation of the furnace.

FOR HOISTING from great depths round, tapering ropes have been used both in Europe and America. On the Comstock one was in use in 1875 hoisting from an incline at 37° 1400 feet, through a vertical shaft 1400 feet deep, the hoisting engine being located on the surface. In Germany taper ropes were in use at the mines of Pzibram, hoisting from a vertical depth of 3900 feet. They were made of crucible steel, having a maximum breaking strain of sixty tons, and had a regular taper. A single wire was cut about each 16 feet and a larger wire welded on (by brazing). Each rope comprised seven strands around a hemp center, and each strand contained six wires around a hemp core. This rope lasted over three years.

SUBSTANCES which have been held by the Land Department to fall within the designation of mineral as applied to mineral lands subject to location on the public domain are asphaltum, petroleum and the mineral hydrocarbons, borax and borax-bearing minerals, nitrate and carbonate of soda, sulphur, alum, clay, kaolin, mica, umher, gypsum, limestone, granite, marble, diamonds, phosphates, building stones, and stones of special commercial values, as corundum, turquoise, tourmalines, etc., coal and slate for roofing. Salt is also classed as mineral, but salt lands are held to be reserved from railroad grants, nor are they subject to disposal under the

mining laws. Land may be determined and classified a mineral when the substances it contains is recognized as mineral according to its chemical composition by standard authorities on the subject, or it is classified as a mineral product in commercial trade, or where there occurs in the land mineral substances which possess economic value for use in trade, manufacture, the sciences, or in the mechanical or ornamental arts, and when substances of the nature stated occur in such abundance in the land as to make it more valuable for mineral than for agricultural or other purposes.

ALL valuable mineral deposits on the public lands of the United States, both surveyed and unsurveyed, are free and open to exploration, purchase and occupation, by citizens of the United States, and to those who have declared their intention to become such, under the regulations prescribed by law and according to the local customs or rules of miners in the several mining districts, so far as the same are applicable and not inconsistent with the laws of the United States. The limit of maximum length of a claim is 1500 feet along the vein, and the maximum width 300 feet on each side of the center of the vein. No local law or regulation shall limit the width of a claim to less than 25 feet on either side of the center of the vein at the surface.

IN dry-crushing stamp mills, wooden wedges are not suited to securing the stamp in the bosshead, as the stamp becomes heated by impact, the wedges dry out or become charred and allow the stamp head to drop out. Thin metal strips are employed for this purpose. For expediting the fixing of stamp shoes in bossheads in wet-crushing mills, the wooden wedges may be tacked to strips of drilling. These may be quickly wrapped around the shoe shank, and the stem and bosshead allowed to fall upon it in the usual way. When stems or shoes cannot be driven out of a bosshead by means of wedge and hammer, small pieces of nitro powder will usually have the desired effect, but an overcharge is likely to burst the bosshead; consequently good judgment is required in its use.

THE phenomena of electric discharges in vacuum tubes give the nearest approach to seeing electricity that are likely to be made. The streams of corpuscles propelled along the tubes suggested to Crookes in 1870 the idea of a fourth state of matter, and these corpuscles—smaller than atoms and the same in all kinds of gases—were named electrons by Stoney, and have come to be regarded as the electric parts of all atoms, or even as making up matter itself. When torn from its groups or from matter, the electron travels with a speed comparable to that of light. A body charged with electricity, if at rest, presents the phenomena of electrostatics; if in motion, those of electricity and magnetism; if in acceleration or change of motion, those of light and radiation generally. Some substances—such as uranium, polonium and radium—throw off electrons without stimulus, giving intense and penetrating rays, with a kind of "electrical evaporation." This property of radio-activity is found in many bodies, even in leaves and newly fallen raindrops, and it will soon be difficult to find any substance without it in some degree. On the hypothesis that matter is composed of electrons, their size is known to be about the hundred-thousandth part of the diameter of the atom. In an atom of hydrogen there are about 1000 electrons, in an atom of mercury there are 100,000; but even in the latter they are shown by calculation to be about as far apart in proportion to their size, comparatively, as the planets in the solar system. By their force the atoms come to be impenetrable. Of the fundamental properties of matter, inertia is considered to be electrical, cohesion is being shown to be so; gravitation is still a mystery.

COAL LANDS may be entered at the proper United States land office by individuals or associations of persons. In the case of an individual he must be above the age of twenty-one years and a citizen of the United States, or must have declared his intention to become such. In an association of persons each one must possess the requisite qualifications. The right to purchase coal lands can be exercised but once. All locations must be made on the public (unoccupied) surveyed lands of the United States, and must conform to the lines of survey. A single individual cannot take more than 160 acres of coal land, nor a corporation or association more than 320 acres. Tracts applied for must be contiguous. The applicant must file with the register of the proper land office a verified application describing the lands sought to be purchased, his qualification under the law to make the entry, etc. If the tract is clear the price is fixed, depending on the situation of the lands in reference to a completed railroad—if within 15 miles of a railroad, at \$20 per acre; if more than 15 miles from a railroad, at \$10 per acre. The applicant must be in actual possession of the lands he has applied for, and he must, prior to final entry, have opened and improved the mines situated thereon. The claimant must within sixty days of assuming actual possession of the land present at the land office his declaratory statement of facts. Failure to provide this instrument within the time specified renders the land subject to entry by another. Final proofs must be made and the land paid for within one year from the time of filing respective claims. Within this time—one year from time of making declaratory statement—claimant must make his application to purchase, and submit proof showing compliance with the law.

Copper Production on Lake Superior.

Final figures of production of refined copper by Lake Superior mines in 1902 are now all in, except for the Trimountain, and in that case the estimate of 6,000,000 pounds is based on an unofficial but direct estimate of the company. The figures for 1901 will be found to differ materially from the generally accepted statistics, but those given herewith are believed to be accurate. The erroneous figures in general circulation are due mainly to errors in the statement of output of the Calumet & Hecla, caused by the fiscal year of that corporation ending on April 30. The following figures are for production during the calendar years in each case:

Mine—	1902.	1901.	1900.
Calumet & Hecla....	81,248,739	82,519,676	77,761,382
Quincy.....	18,988,491	20,540,720	14,116,551
Tamarack.....	15,961,528	18,000,852	19,182,502
Oseola.....	13,416,396	13,723,487	12,566,471
Wolverine.....	6,473,181	4,946,126	4,789,829
Baltic.....	6,285,819	2,641,432	1,735,060
Trimountain.....	6,000,000	.....	.....
Franklin.....	5,259,140	3,757,419	3,663,710
Atlantic.....	4,949,366	4,666,880	4,930,149
Champion.....	4,165,784	.....	.....
Isle Royale.....	3,569,748	2,171,955	.....
Mass.....	2,345,805	950,000	122,239
Adventure.....	806,211	29,361	23,572
Arcadian.....	600,000	500,000	1,350,000
Mohawk.....	226,824	160,890	.....
Michigan.....	133,373	.....	33,601
Winona.....	101,188	.....	.....
Centennial.....	.....	806,400	892,500
Arnold.....	.....	108,000	856,000
Phoenix.....	.....	93,643	88,206
Miscellaneous.....	500,000	50,000	73,400
Totals.....	170,831,593	155,716,848	142,151,571

These figures show a gain of practically 10% for each of the two preceding years. For 1903 the increase will be more than 15%, and possibly 20%. The increased production secured in 1901 and 1902 were practically the first increases for five years and reflect the increased productive capacity of the district, brought about by the opening of new mines rather than any marked increase in the output of the older mines. The actual production of the new mines was a trifle more than 5,000,000 pounds in 1901, and upwards of 20,000,000 pounds for 1902, and should be doubled during the present year.

The output of the Calumet & Hecla was practically the same in 1902 as in the preceding year, and the mine is now producing at practically the same rate, of about 7,000,000 pounds of refined copper monthly. The new 6-stamp mill of the Calumet & Hecla, now going into commission, will not increase production for some time to come, as the old mill is to be rebuilt in sections as soon as the new stamps begin duty. Eventually this will give the property materially increased stamping capacity. It is not certain, however, that it would be wise to crowd the mine much above the present production, which is approximately 6000 tons of rock daily. If the amygdaloid mine on the Oseola lode is worked, as may be done if copper holds at a good price, the Calumet & Hecla can closely crowd an annual output of 100,000,000 pounds, or at the present rate of production of the Anaconda (now, and for some years past, the world's largest producer of copper). The outputs of the Calumet & Hecla and Rio Tinto of Spain have been practically the same for several years past.

The Quincy shows a slight falling off from the preceding year. This was due to the mining and stamping of rock of much lower average grade than formerly. In order to feed the stamps about 3400 tons of rock are supplied to the mills daily, and it is impossible to furnish such a large tonnage of as high grade as obtained formerly, when but a third to a half of this output was required. The Quincy is now one of the best equipped mines in the world, and should be able to maintain an annual output of approximately 20,000,000 pounds of refined metal for some years.

The Tamarack showed a marked decrease in 1902. The three deep shafts have thus far proven somewhat disappointing and the grade of rock stamped has declined for some years, even though the bulk of the Tamarack production is from the Calumet conglomerate. The expense and strain of operating a mine 1 mile in depth may be guessed at, but can be fully understood only by those in actual charge. However, the Tamarack will be a big mine and a large producer for a long time to come.

The Oseola output for 1902 was but a trifle less than in the preceding year, contrary to the general expectation of a large decrease. The mines and mills are again working full forces, and the Oseola should show an output of 20,000,000 to 25,000,000 pounds this year.

Wolverine, which has shown an increased output during every year of its life, made a large gain in 1902, and is expected to make a still larger gain during the current year, probably 10,000,000 pounds, placing the Wolverine among the largest producers. The Wolverine is making the cheapest copper of any Lake Superior mine.

Trimountain is the largest producer of 1902 among the new mines. An output of 6,000,000 pounds for its first year of production looks large, but the 1903 figures are expected to exceed this. The Champion,

which adjoins the Trimountain, is working the same lode. The Champion's output of over 4,000,000 pounds will also look small when the figures for this year are given out. The recent tempest in a teapot on the floor of the New York Metal Exchange about the presence of arsenic in the copper of the Champion, Trimountain and Baltic mines appears ridiculous to those conversant with the copper trade. The existence of an unusually large percentage of arsenic in the refined copper from the "south range" mines has been known in copper circles since the Baltic began production. Few of the Lake mines, at depth, are as free from arsenic as was the case twenty or even ten years ago. For certain uses arsenic is deleterious, while for other purposes it is an advantage. More and more of the Lake copper is being refined electrolytically, and in time all but a few special brands will go through the tanks. The 1902 output of the Baltic exceeded 6,000,000 pounds and will show another gain this season. The Franklin exceeded 5,000,000 pounds output for the first time in its history, and made a record of output and costs from a refractory lode that has formerly been worked at a loss. Atlantic held its own and a trifle more. At present the showing is more encouraging at this property than for some time past. The Atlantic is a good example of successful work on an extremely low-grade ore body.

Isle Royale's showing for 1902, considering that it was worked under check for the greater part of the time, was good. The mine is not rich, but it is well equipped. The only possibility of dividends lies in working the mine on a large scale, which is not being done at present.

The output of the Mass mine showed material gain in 1902, though not as large as had been anticipated. The Mass needs further development before it can supply its stamp mill to advantage. The Adventure's mill was started in the fall of 1902 and the production of 606,211 pounds was disappointing. The mine is not capable of supplying the mill with selected rock to its full capacity and is now running under check. The Mohawk mill was started so late in the year that the 1902 production was trivial. For the current year the Mohawk should make nearly 8,000,000 pounds, and with the third stamp in commission will be able to increase it. Eventually the Mohawk will increase its milling capacity to four stamps, which will handle nearly 2000 tons of rock daily.

The small output of the Michigan was secured exclusively from heavy copper taken out of shafts, drifts and crosscuts in the work of opening. None of the stamp rock so secured was treated, and no copper removed except where necessary to make room for the passage of mine openings. The Arcadian is running only one stamp part time on its own rock, the other heads being leased to the Trimountain. The output for 1902 was larger than that of the preceding year. Winona's output of 101,188 pounds refined copper was secured from rock stamped under one head of the Atlantic mill in the last few weeks of the year. This stamp is still running on Winona rock and is securing about 1% copper.

The Centennial was out of the running in 1902, but has opened some fine ground in its new shafts on the Kearsarge lode, and should become a producer again in the near future. The Phoenix will have one stamp running next summer. The Arnold is closed down, with no likelihood of an early resumption.

Houghton, April 18.

HORACE J. STEVENS.

[In comparison with the above, following is given as the output of the Rio Tinto mines of Spain for the past three years: In 1900 there were produced 71,464,000 pounds; in 1901 the output was 70,696,000 pounds, and in 1902 it fell to 68,956,000 pounds.—Ed.]

Topographic Mapping of Arizona, 1903.

Plans have been completed for securing vertical and horizontal control for an area of about 3000 square miles in southern Arizona, and two parties have been sent to the field by the United States Geological Survey.

A triangulation party, in charge of T. M. Bannon, has commenced work near Florence on the Gila river, Pinal county, and is working southward, intending eventually to close work on the international boundary line in the vicinity of Nogales, Santa Cruz county.

A second party, in charge of M. S. Bright, will determine the elevations for the area, commencing at one of the bench marks on the Mexican boundary line and running accurate spirit level lines northward through Santa Cruz, Pima and Pinal counties to close on bench marks previously established in the vicinity of Florence and Riverside. Iron posts will be placed at intervals of from 3 to 5 miles along the lines on which elevations above sea level will be indicated.

H. H. Hodgeson will act as topographer with the level party, and will make a contour sketch of the lines leveled over. He will also make careful examinations and sketches of all possible reservoir sites that may be discovered. This work is but preliminary to the topographic mapping of an area of about 2000 square miles, which will be commenced next fall

and finished during the winter. The survey is designed to aid in the development of the irrigation, timber and mining interests of the country mapped.

The Picacho Basin Mines.*

About 25 miles north of the town of Yuma, Ariz., in San Diego county, Cal., is a high tower-shaped eminence called Picacho, or peak. It rises 1500 feet above the Colorado river and is the most prominent landmark in that region of fantastically sculptured hills. The Picacho is made up of a series of rhyolitic and andesitic rocks, representing a long period of volcanic eruption. There are rhyolites and liparites, hornblende and augite andesites, tuffs and breccias, and more recently basalts, in the region, which, excepting down in the valley bordering the Colorado river, is a typical desert, where rain seldom falls and where the range of temperature is wide, that of summer being particularly high.

Out of the vast field of volcanic rocks erosion has carved the rugged hills, with their sharp, clear-cut outlines, removing most of the volcanic rock and exposing the underlying older crystalline rocks. The Picacho is but a remnant of the lava deposit, which must have at one time had a thickness approximating 2000 feet. The peak has suggested the name of the mining district, which covers 40 square miles of the adjacent territory. The older rocks, exposed in the low, rolling hills in the Picacho basin, extending several miles along and back from the Colorado river, are micaceous and hornblende schists, with a few intrusive dikes, mostly diorite and granite (pegmatite). Over a large part of the region adjacent to the Picacho there is a deposit of auriferous gravel. To the eastward the rocks have a greater variety and are intruded by many dikes, large and small. This section is known as the White Gold basin, from the fact that the gold occurring in the veins here is alloyed with silver to such an extent as to give the metal a light color. The rocks here are mica and hornblende schist, diorite, granulate, cherts, and felsitic eruptives. There has been much metamorphism, and there are gold-bearing veins or zones of large size coursing in nearly parallel directions. These are five in number and are from 20 feet to over 100 feet in width. The rocks are greatly fractured and crushed, and have been extensively mineralized by the infiltration of silica and iron sulphide, which upon oxidation has left a porous siliceous mass, colored red, yellow or brown by iron oxides. This rock or ore contains gold and silver and is the source of the dry placers that for years have been worked by the Mexicans and Indians in a primitive way—by wind-tossing; panning, when there was rain water available, and more recently by dry-washing machines. Some prospecting has been done on these large zones of low-grade ore, but no systematic development has been undertaken.

In the region adjacent to the Picacho, however, the California King G. M. Co. have carried on extensive development in zones of gold-bearing rock which appears to be the result of mineralization of crushed masses of the country rock, into which silica and gold have been infiltrated and deposited. Here, however, the gold is high grade and the silver is present in relatively small quantity. There are numerous white quartz veins traversing the rocks of this portion of the district, but for the most part these are not gold bearing, or only slightly so. The principal development is about 4½ miles back from the Colorado river.

The accompanying engraving illustrates the appearance of this desert basin with the rugged topography of the surrounding hills, which are all of volcanic origin. The ore is mined by open cut method and sent by railroad to the company's mill, located on the Colorado river.

The gold-bearing gravel of this basin has been worked in a primitive way by Mexicans, in the same manner as that to the eastward, but about twelve years ago a company was organized to operate these dry placers by hydraulic method, pumping the water from the river. A large pumping plant was installed and a pipe line 5 miles in length laid to the gravel beds, situated near the present site of the company's mines. This plant cost nearly \$500,000. The engraving illustrates the site of the pumping plant now dismantled. At the head of the pipe line was constructed a circular stove tank, built upon a frame, similar to railroad water tanks, and having a capacity of perhaps 3000 gallons. When all was in readiness and the pumps were started it was found that they did not possess sufficient capacity nor power to lift the water to the tank, to say nothing of hydraulicking under pressure. It was one of the most absurd engineering feats ever undertaken in the West, not hut that hydraulicking may successfully be accomplished in the manner indicated, but under the existing conditions a very large factor for loss in head had to be reckoned with and met. The friction in a 12-inch pipe line 5 miles in length would result in a great loss of head and consequently of power, and as the water had to be lifted a vertical height of 500 feet, it can be seen that to deliver 750 cubic feet of water per minute, or 500 miner's inches—which amount would be necessary to make operations a success mechanically—these conditions would require a very large plant.

* See illustrations on front page.

Hints on Leather Belting.

Written for the MINING AND SCIENTIFIC PRESS by
W. H. KRITZER.

The destruction of machinery, broken pulleys, hot boxes, belts, etc., is a common experience which in

nected to each other by belts, it is not easy to give a definite rule as to what distance to have them separated further than to have them far enough apart to allow of a gentle sag when the belt is in motion, being cautious not to have too great a distance, as the weight of the belt and its accompanying sag will pro-

the belts all pull one way on the shaft. When using guide or tightening pulleys they should be applied to the slack side of the belt and near the smaller pulley. Belts adhere much better and are less liable to slip when run at a fast speed than at a slow speed, therefore, when possible, it is better to arrange to run small pulleys and run them at a high velocity than to run large pulleys.

A greater amount of power can be had from belts by having the crowns of the driving and receiving pulleys exactly alike and covering the face with leather, also having them wider than the belts required for the work. The width of belt needed depends on the speed and tension, the size of the smaller pulley and the proportion of its surface touched by the belt. The average thickness of single-ply belting is $\frac{3}{16}$ inch.

Belts made narrow and thick are more durable and work more satisfactorily than thin and wide ones, but it is not advisable to use a double belt on a pulley less than 12 inches in diameter, a triple ply on less than 20 inches in diameter, or a quadruple on less than 30 inches in diameter.

Quick motion belts should be selected as straight and as uniform in width, thickness and density as possible, and with permanent joints is practicable, that is, endless, and when the ends are joined lift out shafts, place belt on the pulleys and force shaft into place.

To find the length of belt needed when you have the diameters of the pulleys, and the distance between the centers of the shafts, multiply half the sum of pulley diameters by 3.2 and add twice the distance between the centers of the shafts. This result is usually near enough for practical purposes. If, however, the diameters are very different and the centers short the result will be too small. If the pulleys are exactly the same diameter multiply by 3.1416 instead of 3.2.

To find the horse power of belting: Multiply the width of belt in inches by the diameter of the pulley in inches, and this product by its number of revolutions per minute, and divide by 3300 for single, and 2100 for double. If one pulley is smaller than the other, multiply the result obtained by the corresponding factor in the table below.

To find the speed of a belt: Multiply the circumference of the driving pulley in feet by its revolutions per minute.

To find the width of a belt in inches required to transmit a given horse power: Multiply the number of horse power by 800 and divide by the speed in feet per minute. For unequal pulleys divide by the corresponding factor given in the table below:

TABLE OF CORRECTING FACTORS TO BE USED WHEN DRIVING AND DRIVEN PULLEYS ARE OF DIFFERENT DIAMETERS.

Arc of contact of belt on small pulley—	Correcting factor.
90°	0.65
120°	0.79
150°	0.91

To find the necessary speed in feet per minute to transmit a given horse power with a belt of a given width: Multiply the number of horse power by 800 and divide by the width in inches. For unequal pulleys divide by the proper factor in table.

To find the number of revolutions of either pulley, the revolutions of the other and the diameters being known: Multiply the diameter of the latter by its revolutions, and divide by the diameter of the former.

To find the diameter of pulley, the horse power and width of the belt being given: Multiply the horse power by 2750 for single, and 1925 for double, and divide the product obtained by the width of the belt in inches multiplied by its revolutions per minute.

To find the length of a roll of belting (approximately): Take the sum of the diameter of the roll and the "eye" in inches, multiply this by the number of turns or laps made by the belt, and this product multiplied by the decimal .1309 will equal the length of the belt in feet.

To find the weight in pounds of belts (approximately): Multiply the length of the belt in feet by the width in inches and divide the product by 13 for single, and 8 for double.

To find the arc of contact on small pulley of an open belt, multiply the difference of diameters of the pulleys by 57.3 and divide by distances between centers. Subtract the result from 180°.

Order belts equal to the work and surrounding conditions.

In fastening belts have ends perfectly straight and square, use clamps and splice on pulleys when over 6 inches wide.

Up to 18 inches in width make the splice the width of belt.

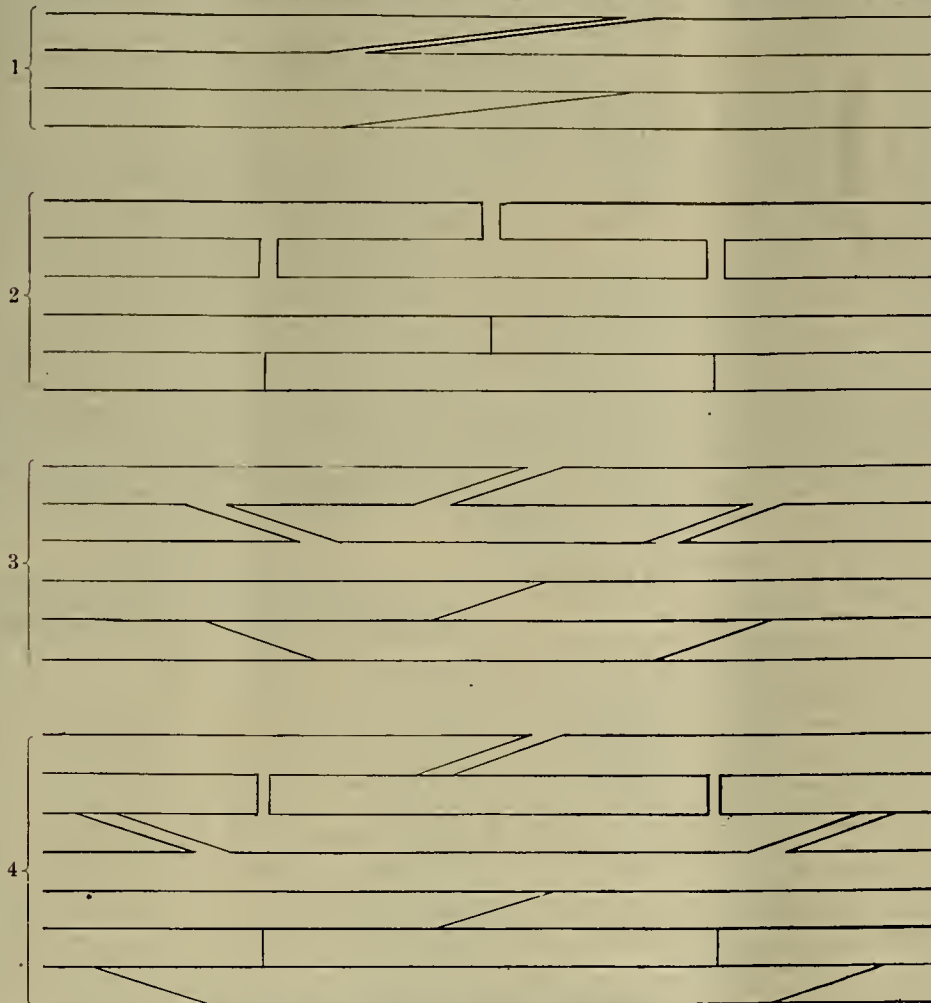
In punching holes cut out no more than is necessary; on leather use no awl.

In lacing have strings parallel on inside of belt; do not use wide or thick strings, and the oval hole with the hinge joint is best.

Keep clean, dry and free from accumulations of dust and grease, particularly oils.

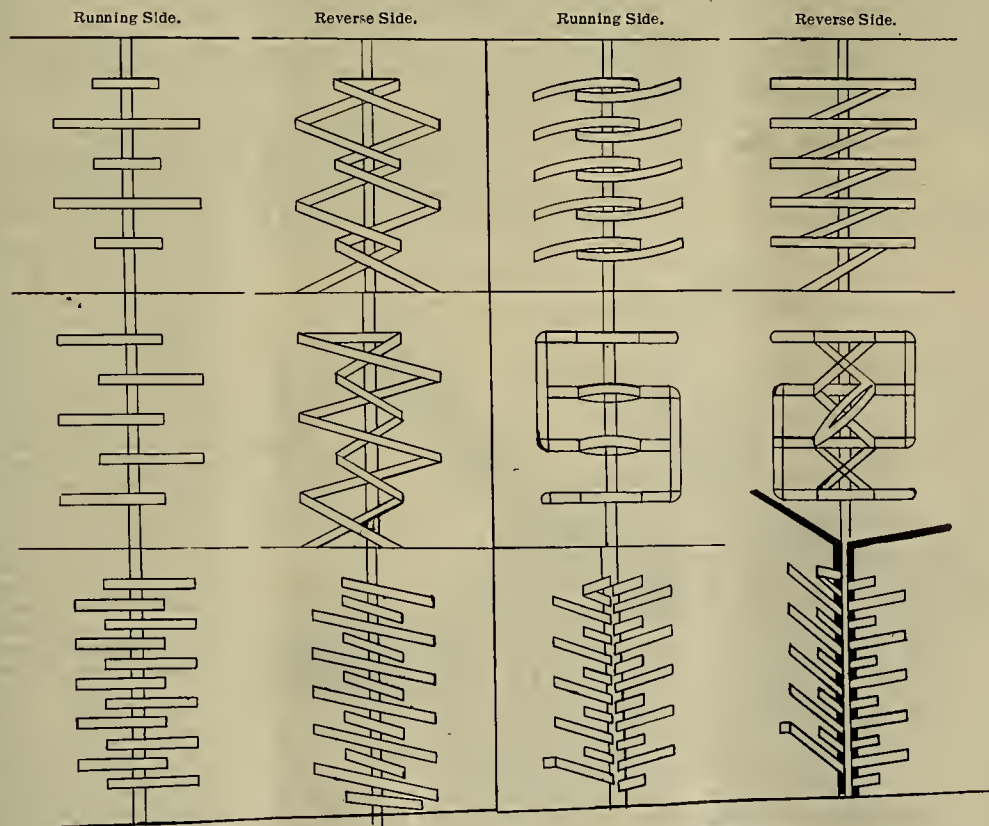
Splice and mend by cement rather than by riveting, lacing, wiring or using hooks.

Belts should be used with the grain or hair side



- 1—Single-ply belt before and after joining with taper splice.
- 2—Double-ply belt before and after joining with butt joint.
- 3—Double-ply belt before and after joining with taper splice.
- 4—Three-ply belt before and after joining with two taper and center butt joints.

Drawings Showing the Manner of Preparing and Securing One, Two and Three-Ply Belts.



Hinge Joint.

Sketch Showing Running Side of Belt (Next to Pulley) and Reverse Side of Lacing Away From Pulley.

most cases can be traced to the arrangement of the machinery, and in the style and width of belts used, and in the manner of their care. As circumstances generally have much to do with the arrangement and location of shafts and pulleys that are to be con-

duce an unsteady flapping motion and undue friction in the bearings. This last fault can be partially corrected by having the belts run off of each shaft in opposite directions, as this arrangement will relieve the bearings from the friction that would result when

next to the pulley, as they will drive 30% more and are not so liable to crack when they get old.

The direction of driving should run with and not against the lap.

The speed in feet per minute should not be over 4000 to 4500 for maximum economy.

Leather belts will not safely stand above 110° of heat.

Keep well protected from moisture, steam and water, and use rubber belts when exposed to the weather, as it does not stretch or decay.

Belts in time will usually stretch one-sixth the original length.

For a belt dressing use beef tallow, beeswax, prepared castor or neats-foot oil. Resin should never be used.

Power should be applied to the lower running side of a belt; let the upper side carry the slack.

All belts should run slack; if more power is required increase belt speed by using larger pulleys.

Strength of a belt increases directly as its width.

Power lost in belt transmission is from 20% to 80% of the power produced.

Factor of safety for a laced belt is one-sixth its breaking weight for leather, and one-eighth for rubber.

Double belting transmits about twice the power of single; light double one and one-half that of single.

Mines of Cherry Creek, Siskiyou County, Cal.*

Written for the MINING AND SCIENTIFIC PRESS by
H. W. TURNER.

Cherry creek heads at a divide about 7 miles southwest of the town of Yreka, and flows southwesterly to Scott valley. The lower part of the stream goes under the name of McAdams creek, the waters of which drain into Scott river, itself a branch of the Klamath.

The formations of this section of the county have a general northeast-southwest trend. The crest of the ridge to the south of Cherry creek is made up, in part, of fine-grained cherty rocks, of sedimentary origin, which in general appear to dip southeasterly. Underlying these cherts is an extensive greenstone series, evidently of volcanic origin, and chiefly fragmental in character, much of it being breccia or tuff. All of these rocks are older than the Cretaceous and probably of Jura-Trias or Carboniferous age.

Cherry creek ravine has been eroded out of this greenstone, which is everywhere much shattered and penetrated by veinlets of quartz and spar. Pieces of it usually show sulphides of iron. This greenstone belt contains all of the mines of the district, the best known of which are the Mount Vernon, the Cherry Hill, the Ironside, the Nebraska, and the Drummer Bay. All of these lie on the slope south of Cherry creek. In early days Cherry creek and its branch gulches yielded a large amount of placer gold. This quite certainly came from veins in the greenstone. One seldom finds so wide a zone of such thoroughly jointed and sheared and mineralized rocks as in this greenstone belt. Much of the placer gold doubtless came from seams and pockets, and, in general, one of the weak points of the district is the lack of strong, persistent and definite fissures, and the concentration of the gold values in these. Nature seems rather to have spread her treasures through too much ground, depositing the gold in numerous minute seams and pockets.

The Cherry Hill property is the one most developed. This is credited with a production from quartz veins in recent years of perhaps \$150,000. There are numerous veins on this property, two of which show the best values—the Little Queen, an east-west vein, with an average width of about 1 foot, and the Doctor's ledge, a narrow vein, averaging about \$25 in value. The trend of this vein is nearly true north, the dip being to the east at an angle of about 30°.

The croppings of the Queen vein cut across the top of the spur known as Cherry hill. The dip is to the south at an average of about 62.5°. An inspection of the old stopes suggests that the pay shoot was about 250 feet wide on the level of the middle tunnel, and about 200 feet wide on the lower tunnel level.

The gold is chiefly coarse and is frequently associated with galena. The sulphides embrace pyrite, chalcopryrite, blende and galena. Some of the galena, separated from the other sulphides and assayed, gave a return of \$133 gold per ton, while a similar test on ore rich in blende gave only low values.

The Cherry Hill veins are now being opened in depth by a long crosscut tunnel, which should tap the Queen vein at a point 700 feet vertically below the croppings. This tunnel has been run with machine drills. It is now in 1767 feet. Two ledges have been crosscut, but neither of these appears to be the Queen vein, which must flatten out slightly in depth. In all probability this vein is but a few feet south of the present face of the tunnel.

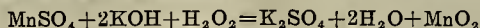
The region is well supplied with white and red fir for mining timbers, and there is an abundance of water, which is, however, rather rich in lime.

* See illustrations on front page.

DRAINAGE TUNNELS run through barren rock to reach a vein are only justifiable when it is known from development of the vein that the result will pay for the necessary outlay.

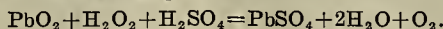
Use of Hydrogen Peroxide in Volumetric Analysis.

The manganese in manganese salts can be determined by converting it into manganese dioxide by means of hydrogen peroxide in alkaline solution, according to the Bulletin of Analytical Chemistry. The reaction is as follows:



and reducing the dioxide by means of an acid solution of hydrogen peroxide. The excess of hydrogen peroxide is then determined by titration with potassium permanganate. The total amount used is divided by two in order to obtain the equivalent amount of manganese. Free hydrochloric acid, if present, must be removed by boiling.

The active oxygen in lead peroxide and red lead can be determined in an analogous manner, the reaction in this case being



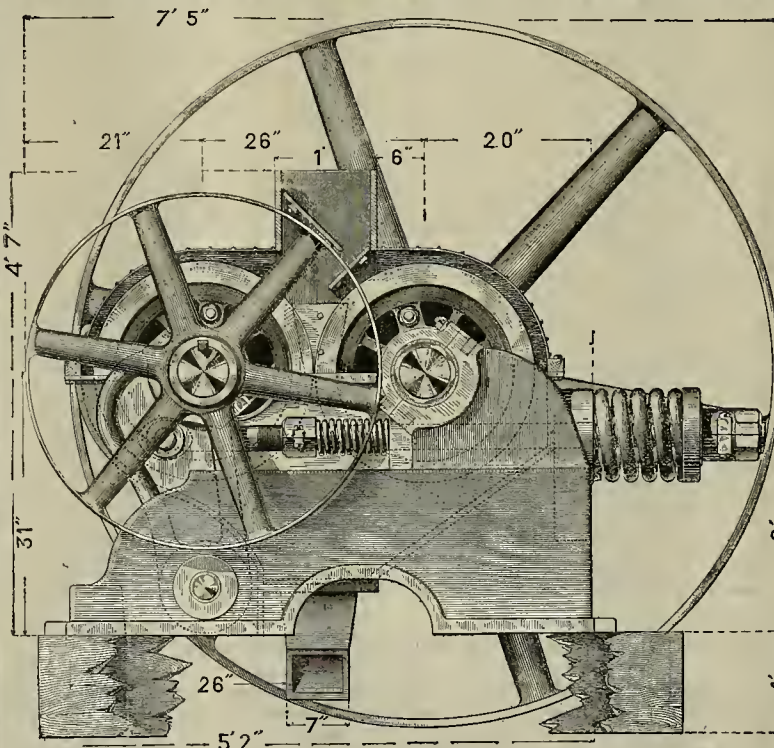
From 0.5 to 0.7 of the lead oxide is treated with a nitric acid solution of hydrogen peroxide of a known strength; 10 c.c. of dilute sulphuric acid are then added to the solution and the excess of hydrogen peroxide titrated with potassium permanganate.

For the determination of the metal in lead salts, lead peroxide is first formed by treatment with bromine and potassium hydroxide, and then reduced by treatment with an acid solution of hydrogen peroxide. In the case of mixtures of lead and copper salts, the lead is converted in this way into lead peroxide, and the precipitate collected, washed and reduced with the standard hydrogen peroxide. It is also possible to separate the lead as sulphate from mixtures of the salts of lead with other heavy metals, and to convert the lead sulphate into lead peroxide, which is determined as described above.

The presence of sulphur in various substances may also be determined by the use of hydrogen peroxide, as shown by J. Peterson in the Analyst for March. In the case of gunpowder, the sample is hoiled with an alkali in order to bring the sulphur into solution as a sulphide, then oxidized with hydrogen peroxide, and the sulphuric acid thrown down from an acid solution with barium chloride as usual. For greater accuracy, the acid liquid must be filtered from the carbon, and evaporated to dryness to remove the nitric acid before adding the precipitant. In many organic compounds, such as thiourea, allylthiourea, thiocarbanilide, potassium xanthate, dioxanthogen, carbon bisulphide, potassium thiocyanate, etc., the sulphur may be determined by dissolving the material in 100 c. c. of water or 80 c. c. of alcohol, and treating with 10 c. c. of 8% sodium hydroxide and 50 c. c. of a 3% solution of hydrogen peroxide. After driving off the alcohol on the water bath, water and hydrochloric acid are added, and the sulphuric acid precipitated as usual. There are, however, many organic compounds, such as thiophen, ethyl sulphide, thiophenol, and ethyl thiocyanate, in which the sulphur is not converted into sulphuric acid by the author's process. In esters of thiocarbonic acid, for instance, where it might be expected that one atom of sulphur should behave differently from the others, one-third of the sulphur is recovered by the method described.

Krom Cushioned Rolls.

In the Krom cushioned rolls illustrated herewith, the crushing springs are carried in cages to not



Krom Cushioned Rolls.

yield under ordinary crushing strains, the cages holding these in compression so that they may be independent of adjustment. Reverse springs on the inner parts of each tension bar act oppositely to the crushing springs, to hold them always against the frame, to keep the bars in a cushioned state, and thus prevent the movable roll from pounding against the fixed roll if the feed stops or iron passes the rolls. The movable hearings are kept in alignment by a solid connecting yoke, they thus being held in line whether or not the work is evenly distributed, or the spring tension on both rolls is not uniformly adjusted.

The tires are of Krom steel, secured by fixed and split cones, to make them rigid and quickly and easily removable, and to wear without grooving.

The frame is a strong single casting, the housings single hoods easily removable, the hearings of bronze with large oil wells. The roll shown in illustration is the 26-inch, having a width of 15 inches across the tire faces, giving great capacity.

By long experience in crushing with rolls the makers say that they find that to drive the rolls much faster than the material which they are crushing can fall to them from the hopper is not only a useless waste of power, wear and tear on the machine, but also increases the amount of slimes produced. Hence the rolls are designed to run at 100 revolutions per minute.

These rolls are supplied by the Krom Machine Works, 170 Broadway, New York City, N. Y.

Gems in the United States.

In his report to the United States Geological Survey, Geo. F. Kunz gives the following table of production of precious stones in the United States during 1902:

Sapphire	\$115,000
Ruby	.....
Topaz	.....
Beryl	4,000
Emerald	1,000
Phenacite	.....
Tourmaline	15,000
Peridot	500
Quartz	12,000
Quartz, smoky	2,000
Rosette quartz	200
Amethyst	2,000
Gold quartz	3,000
Rutilated quartz	100
Agate	1,000
Moss agate	500
Chrysoprase	10,000
Silicified wood	7,000
Rhodolite	1,500
Garnet (pyrope)	1,000
Amazon stone	500
Turquoise	130,000
Chlorastrolite	4,000
Mesolite	1,000
Pyrite	3,000
Anthracite ornaments	2,000
Catlinite pipestone	2,000

This gives a preliminary total of \$318,300 for 1902, as compared with \$289,050 in 1901, and \$233,170 in 1900.

A CHAMBERED VEIN may be described as a deposit of ore lying on one side or on both sides of a fissure vein which is nearly regular in width, and constituting an enlargement of the vein, the enlargement being irregular in size and the ore usually of brecciated character. It should be distinguished from a swell in the vein which results in the formation of a lens-like mass of regular form. Chambered veins are doubtless the result of a fracturing of the country rock adjacent to a fissure, due to movement. Somelarge ore shoots appearing at the surface are sometimes disappointing upon development, proving to be merely a mass or chamber of ore adjacent to a small vein. Further exploration in depth, and also longitudinally, may result in the discovery of other chambers.

THE Yak tunnel driven from California gulch, Leadville, Colo., to drain the mines of Brece hill, has been completed at a cost of about \$1,000,000. Its length is 11,000 feet. A deeper and much longer tunnel has been started from Malta, in the valley of the Arkansas river, near Leadville, but work has been discontinued on it for the time being.

Gold Milling Practice in Bendigo.*

Written by H. C. BOYDELL.

This paper treats of the salient features of local gold milling practice and points out in what respects this practice differs from that of other large mining camps.

NATURE OF THE ORE TREATED.—This is essentially a free milling ore, the gangue being quartz and the gold occurring in coarse form. At times the ore crushed contains a great deal of slate, the latter imparting to the tailings a leaden hue.

Small amounts of sulphides, chiefly iron pyrites, and at times smaller quantities of arsenical pyrites, zinc blende and galena are contained in the stone. The average amount of sulphides contained in the ore cannot well be ascertained, as the concentrates obtained in all cases contain too much silica to form a basis of calculation.

L. A. Samuels informs me that the average is between 1% and 2%, but from samples of ore submitted to me for assay I think this too high and that 1% is the maximum.

DELIVERY TO THE BATTERY.—In no case is direct weighing adopted, the weight of ore being estimated by the number of trucks, or, in case of the battery being at some distance from the mine and carting, therefore, necessary, by the number of loads delivered at the battery. The average weight of ore to the truck may be taken as 10 cwt., the truck having

pinion and door required for the ore bins. In the batteries where hand feeding is in vogue one man or youth feeds ten stamps, the wage being from \$1.25 to \$1.50 per day.

MORTAR BOXES.—The weight of these, of course, depends on the weight of the stamps. It ranges between 2 tons and 3½ tons. The bottom is usually 5½ inches thick. No liners are used, it being considered that, as nearly all the batteries do custom work, the removal of the liners at the frequent "cleanings up" would entail too much work. To make up for this, the box has to be made considerably thicker and the weight, therefore, increased. As the box wears, the internal capacity, of course, increases. Inside copper plates are nowhere used. The discharge is vertical, the discharge opening of the mortar being divided into two by a vertical partition, which is a portion of the casting. The depth of discharge with new dies does not exceed 3 inches, and in some cases is as low as 1½ inch. As the dies wear, this is, of course, considerably increased. Chock blocks are not used to remedy the effect of this in the capacity per stamp.

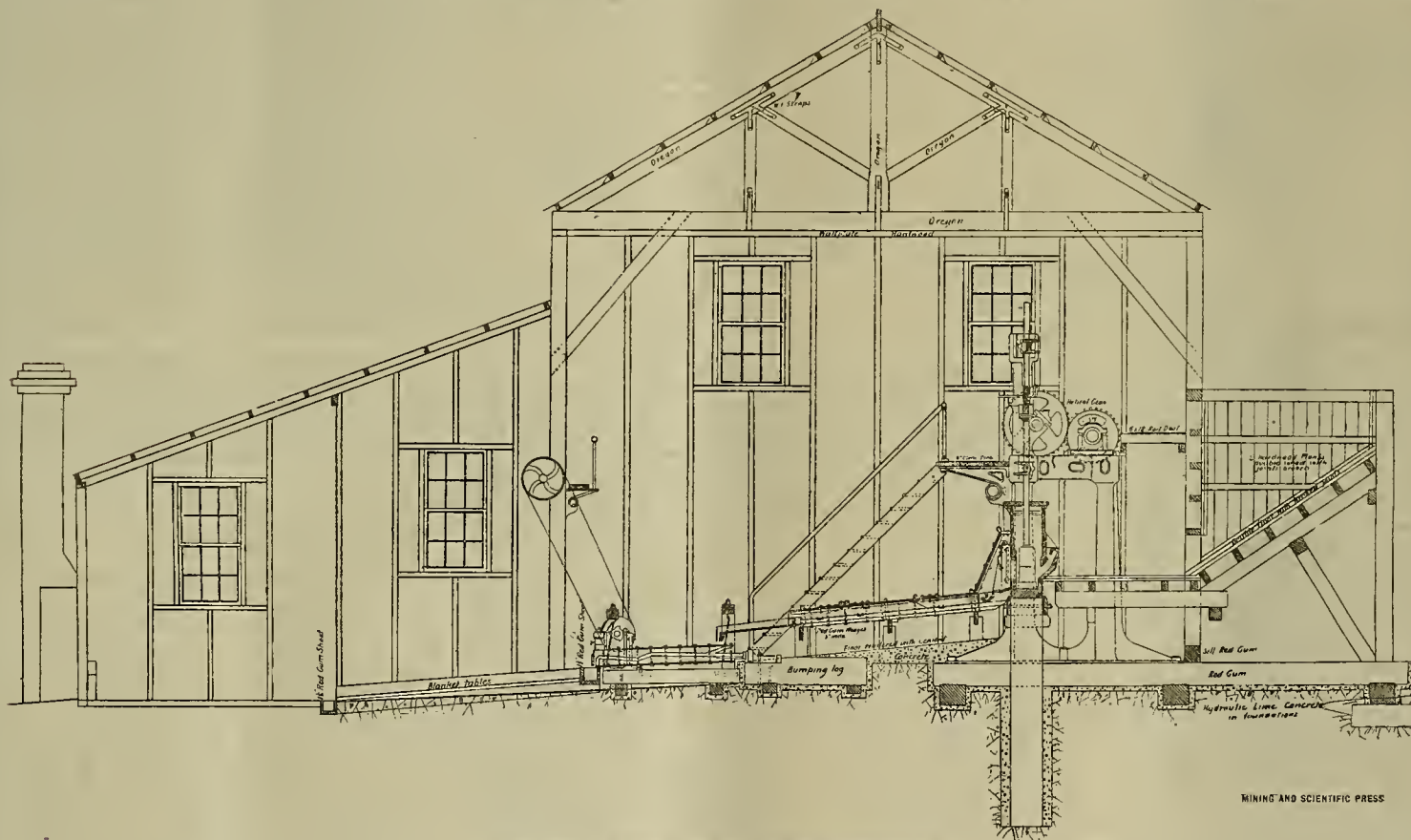
STAMPS.—The weight of these ranges between 600 and 900 pounds. A few weigh 1000 pounds. The average height of drop is from 6 inches to 8 inches, with from seventy-five to eighty drops per minute. The order of drop is somewhat unusual. With each five head of stamps the middle one falls first, then the two end ones together, then the second and fourth, also together.

Shoe, about.....	25%
Tappet, about.....	9%
Total.....	100%
The figures with an 800-pound stamp being:	
Stem.....	Lbs. 345
Boss head.....	185
Shoe.....	200
Tappet.....	70
Total.....	800

CAM SHAFT.—The material is hammered scrap and the average diameter 5½ inches. In all cases the cam shaft is driven by gearing. In no case is helting used. The number of stamps raised by one cam shaft is in no battery on the field less than ten, each ten head of stamps thus having a pinion and spur wheel with the necessary clutch gear. In many cases more than this number of stamps are raised by a single cam shaft, the greatest number that I have heard of being fifteen.

THE GUIDES.—These are of cast iron, held in place by studs and lock nuts. The top guide, and in some cases the bottom one as well, is provided with a pinching screw and lock nut for holding up the stamp. The guides are lubricated with a mixture of anti-friction grease and tar in most cases, waste oily products also being used.

METHOD OF HANGING UP.—This varies somewhat. In some batteries, for instance, only the pinching screw in the top and bottom guide is used. The tap-



Quartz Mill at Bendigo, Australia, Showing Construction.

a capacity of 11 cubic feet. The load averages 20 cwt. and a capacity of 22 cubic feet. Both these weights, of course, vary within fairly wide limits, according to the size of the pieces of ore and the amount of moisture contained in it. Owing to the dryness of the workings and the small rainfall at Bendigo the percentage of moisture is never very high. With the method of estimating weight in vogue the returns of weight of ore crushed at Bendigo batteries can only be taken as approximate. In nearly all cases the stone is delivered into the battery hoppers, which in their turn deliver onto the feeding floor.

PRELIMINARY CRUSHING.—Breaking by hand is the method adopted in all but three mills. The three exceptions are those of the New Chum (English), New Moon and South Moon Companies, where rock breakers of the Gates pattern are in use. The lack of uniformity of size of the hand-broken stone is one of the contributing factors to the comparatively small output per stamp per day which is characteristic of milling in the district.

FEEDING.—The almost universal practice is to feed the ore into the mortar box by hand, only four batteries being supplied with mechanical feeders. These four are the New Chum (where a feeder made at the mine is in use), the Virginia (using an old pattern), and the New Moon and South Moon batteries, in both of which the Challenge feeder is used. At the South Moon the feeders being erected were made locally, costing \$100 each, with an extra \$25 for the rack

THE STEMS.—These are usually 12 feet long, from 2½ to 3½ inches diameter, and of the best hammered iron. The bottom is "jumped up" and then turned to the necessary taper, having a shoulder at its junction with the permanent head. Screwed tappets being used, the stem is provided with a plus thread, which effectually prevents it being turned end for end.

THE TAPPETS.—These are, as has already been stated, of the screwed type. The one most commonly used is Watt's. The California tappet is in use at the Prince of Wales battery. This is made up in three pieces, the material used being cast steel. The face engaging with the cam is case hardened and is removable. The total weight of the tappet complete is, with the heavier stamps, seventy pounds.

THE PERMANENT HEAD (BOSS HEAD).—This is of cast iron, provided with only one drift way for the removal of both stem and shoe.

SHOES AND DIES.—The shoes are made either of hematite cast iron or forged scrap, the dies of forged scrap, hydraulic pressed. The dies average 4 inches in depth when new, and in many cases are worn down to 1 inch in thickness. I can obtain no details with regard to the cost of shoes and dies per ton of ore crushed, the necessary data not being kept. The cost of either hematite iron or forged scrap in Bendigo is \$2.75 per cwt. The proportions which the weights of the various parts of the stamps bear to the whole weight are, approximately, the following:

Stem, about.....	43%
Boss head, about.....	23%

pet in this case is lifted clear of the revolving cam by a lever, the usual wrought iron bar at the feed side of the frame being used as a fulcrum. When the tappet is high enough the top and bottom pinching screws are tightened and the stamp so hung up. In other mills one pinching screw only is used, that in the top guide, together with a horizontal finger bar. In this case the stamp is first hung up with the pinching screw, and then the finger bar placed under the tappet for safety, the tappet being lifted high enough to admit of the finger bar being placed underneath by means of a lever in the usual way. The only battery in the district in which the California finger bar and cam stick are used is that of the Maldon Goldfields Co. at Maldon.

THE BATTERY FRAMES.—These are of various patterns. In some of the smaller batteries the "A" frame is used. The most common form, however, is the "horse." The material in most cases is wood, in a few cases cast iron. In no battery is the "knee" frame used. The use of the "horse" frame is accounted for by the fact of the cam shaft being driven by gearing, which necessitates the counter and cam shafts being on the same level.

THE OUTPUT PER STAMP PER TWENTY-FOUR HOURS.—This may be taken as ranging between 1½ ton and 2½ tons, the average being 2 tons. This is low when compared with American and South African figures, which run close to 4 tons, and in some cases exceed that amount. The absence of rock breakers and self-feeders contributes largely to make the output small. It must also be remembered that mining conditions

*Trans. Aus. Inst. Min. Engs. (condensed).

here do not require that as much stone as possible should be put through in a given time, as is the case in many mining fields. In Bendigo the getting of the stone is the main trouble, and in many cases, were it not for custom crushing, many of the batteries belonging to mining companies would be idle for a considerable portion of the year. Still, even with these conditions, it need not be forgotten that the cheapest way is to put as much ore through the battery as possible in a given time, the labor required being in no way increased by so doing. Here, again, the hush of increased first cost, necessitated by heavier stamps, larger motive power, etc., seems to be an insuperable barrier under present conditions of mining finance.

The cleanup takes place in most batteries weekly, usually on a Saturday. The skimmings are usually worked up every fortnight only. The amalgam is retorted in pot retorts and the gold is, in nearly all cases, sold without being smelted.

The average length of copper plate is 10 feet, set at an inclination of 1 inch per foot, with several steps and a ripple between each two plates. In some cases the last plate is not amalgamated, though what good

The gold scale is digested with nitric acid to remove the copper and the residue melted. The copper plate, if it is to be used again, is scoured clean and then amalgamated in the usual way.

The heating to redness naturally leads to oxidation of the copper, and, as the oxidized parts only amalgamate very imperfectly, it is fairly common to find the plates when subsequently used again for amalgamation to contain spots that tarnish readily and require constant attention. The charge made for scaling in the manner just described is from \$1.85 to \$2.50 per plate, though some years ago it was \$5.

(TO BE CONTINUED.)

The Elmore Process.

Among the most recent metallurgical processes to attract attention is that of effecting a concentration of sulphide ores from their gangue by means of crude petroleum. The process, though still in the stage of development, promises commercially satisfactory results in the future. A long series of experiments made at the University of California have indicated

the possibilities of this novel process.

An experimental plant has been installed at Rossland, B. C., where ores are treated in the same manner that they would be in a larger commercial plant, with the difference that in the experimental plant some of the work is accomplished by hand that would in a large plant be conducted automatically.

The operation of the process as described by H. H. Claudet includes the mixing of the pulp with oil during which operation the oil comes in contact with the mineral values and holds them in suspension.

The separation of the oil from the mineral in a centrifugal machine with a specially constructed solid basket.

The drying of the product therefrom in a second centrifugal machine with a perforated basket.

In the hand plant the mixing is performed in a 3-foot drum about 1 foot deep which revolves vertically and has an opening in the front through which the sample in the form of pulp is poured in. The oil is then added in about the proportion of one-quarter to three-quarters the amount of sample taken, depending on the quantity of mineral therein. There are small haffle plates inside the drum which cause the mixture to get thoroughly agitated simply by turning the drum slowly a few times by hand. When the oil has picked up enough mineral it is skimmed off the water and the tailings are run out through a plugged hole in the circumference of the drum. The tailings are allowed to settle and then are dried, weighed and assayed.

The separation of the oil which has been collected takes place in a small type of centrifugal machine which has a speed of 2000 revolutions per minute and is driven by an electric motor.

The drying is accomplished with the same machine by interchanging the solid basket for the perforated one, which has a cloth bag fitting inside and in which the concentrates are dried.

These are weighed and assayed, and both the actual recovery of values is obtained and also that by difference between the original sample and the tailings.

Having proved in the testing plant that any particular ore is thoroughly suitable to the treatment, it must next be considered, before going further, if the local conditions allow of the concern to be a commercial success, and it may be well to look into these conditions as they would affect the oil process.

It must be expected that the field for the Elmore process will be greatly on the low grade properties, which will necessarily mean that everything must be designed and worked on the most economical lines; and while it is possible to treat at a profit certain ores which could not be worked by any other method, the margin must not be cut too fine, and it should be proved beforehand that there will be sufficient profit to allow for the fluctuations in the metal market and any other contingencies which are likely to crop out.

A Prospector's View.

TO THE EDITOR:—Ofttimes have I wondered why our otherwise generous Uncle Sam is so partial in regard to the mining fraternity—favoring the rich and able to pay people and ignoring the poor prospector's difficulties. While every citizen has a right to a homestead, the prospector, who is the pioneer of all countries and who seldom uses his right for a homestead, has to stay in the mountains and see if his prospect will amount to anything and let, for the present at least, all hopes of a home go by, as he is, through poverty, unable to have too many irons in the fire. But the thing I am coming to is this: Why could not the poor miner, having expended \$500 in labor, or improvements, on each mining claim, and complied with the requirements of the law regarding a patent, have the same rights as a homesteader? In other words, why could not this Government give the land free instead of charging \$5 per acre, so as to put the poor, faithful developer on the same footing as the better favored. Goodness knows it costs \$100 per claim to have it surveyed, besides the fees necessary to get a patent (there is a very small reduction in price if one has more than three claims to be surveyed), so it is obvious that it is beyond the poor man's ability to procure a patent, even if he had the money for the surveyor, which he would have to earn by days' pay, because very few of our class are horn with silver spoons in their mouths. I think, if acted upon by the proper people in the proper place, something could be done to help the never-tiring fortune hunter to secure the ground where he spent so much money, time and energy, at least free of charge from the Government. A decline in copper, silver or lead would not let him lose all, at present, if he had a patent, but he could hunt up a new field until these metals regain such a value as would enable him to come back and work the property. While the Government would probably receive less money for the present, the different States and communities would grow richer through taxes on patented ground. I can not see why this is not worthy of consideration from those people that are supposed to represent us at Washington; it would be one of the best mining laws ever made for poor mining men.

E. KAGEL.

April 12, 1903.

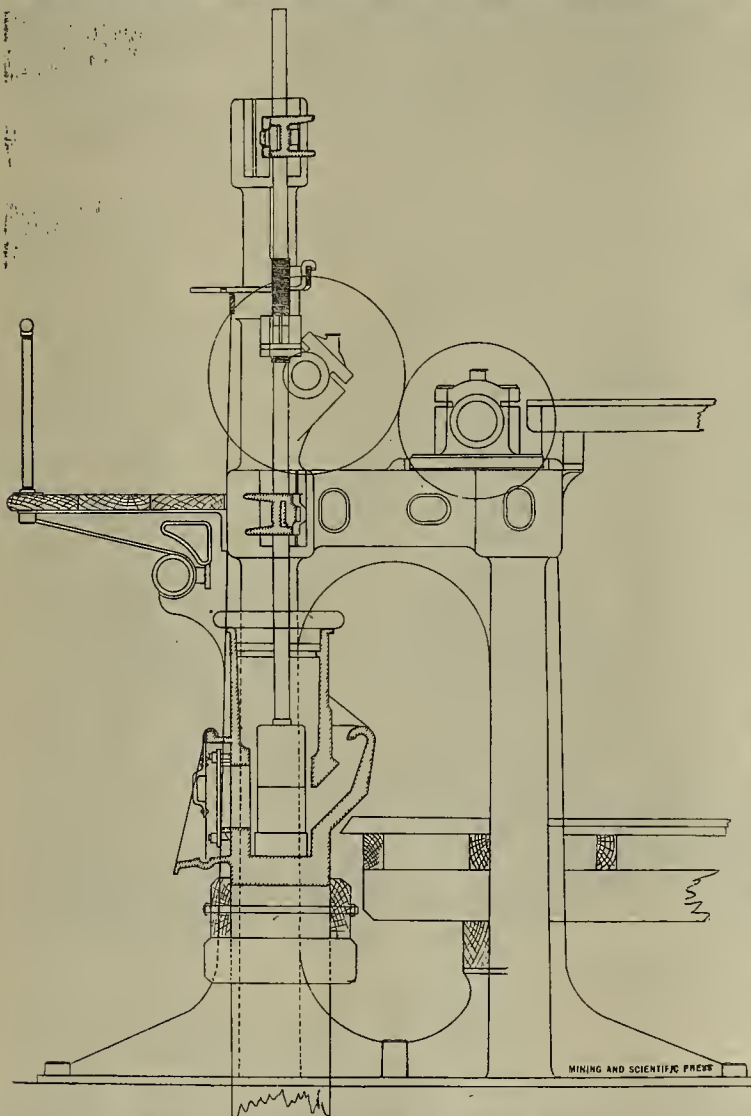
[The mining laws of the United States were framed with a double purpose—to secure every reasonable right and privilege to the prospector and miner, and at the same time to foster and promote the industry of mining. It would be inexpedient to allow claim holders under existing laws to acquire title as in the Homestead entry without cost, as a citizen of the United States may locate as many claims as he desires and can hold all he cares to "represent" by performing the necessary annual assessment work. A claim holder need not apply for a patent to his claim, but may hold it indefinitely, under possessory title, by performing the annual assessment work. As soon as patent is obtained the claim is subject to assessment and tax, and it then becomes an additional source of expense. A claim that has been patented does not improve in value if allowed to remain idle, consequently if there is no intention of working the mine after patent for the reason that it will not pay, it would be a waste of money to patent the claim, and it would be far better to put the same amount of money into the development of the claim. In a general way it may be said that a mining location that does not produce pay ore is not worth patenting. On the other hand, a claim which produces pay ore may be held without patent, but if patent be desired it is usually no hardship to the owner of a paying mine to meet the necessary expense.—Ed.]

Hot Blast in Pyritic Smelting.

TO THE EDITOR:—I am glad to see by your late issues that Messrs. Carpenter and Bretherton both agree that a hot or warm blast is a "sine qua non" in pyritic smelting. I have held that opinion for over two years. With us hot blast spells "success" and cold blast "failure and freeze-up." We heat our blast to 200° C., and that is enough, by waste gases from furnace, boilers or gas engines, and we do straight pyritic smelting. Our blast heating does not cost us a cent, as the heat developed in the furnace is amply sufficient if used intelligently. Pyritic smelting is, after all, only a roasting process, and what we can not oxidize goes into matte. One quarter of one per cent of copper is enough in the ore to catch all the precious metal values, and with hot blast you can do so without barren fluxes, which are necessary with cold blast. A straight silicate of iron slag is all right. Hot blast practice is totally different to cold blast practice, as I know well, and the man who has not worked both is not qualified to judge.

Parral, Mexico.

WALTER E. KOCH.



Battery of the South New Moon Co., Bendigo, Australia.

purpose this can serve is somewhat difficult to see, as the unamalgamated surface is always covered with film of basic carbonate and hydrated oxide.

Mercury is fed into the mortar box at regular intervals, and a considerable proportion of the total weight of amalgam is got from the mortar box at the cleanup. The exact average proportion I have not been able to ascertain. The loss of mercury per 100 tons of ore averages 1 pound.

The plates are usually scaled once in six months, the work being done by men who follow this as an occupation. The method of scaling as commonly adopted is the following:

The plate after being removed from the table is heated over a slow and even fire till all the mercury is volatilized. It is then rubbed with hydrochloric acid, covered with damp hags, and allowed to stand usually till the next morning. Next the plate is rubbed with a strong solution of equal quantities of ammonium chloride and niter. It is then slowly heated till uniformly red hot, and allowed to cool.

The gold rises in blisters and is scraped off with a chisel. Should any part of the plate be left unaffected by this treatment, it is again rubbed and heated. In some cases the heating is not carried to redness till the plate has become so brittle that it has to be discarded. A plate in this condition is usually sold for old copper, though not, as far as I can find out, at a price based on its assay value.

Water Hoisting in the Anthracite Region.*

Written by R. V. NORRIS, Pittsburge, Pa.

The removal of mine water by hoisting in tanks instead of pumping, while somewhat a reversion to the methods of the ancients, has come rapidly into favor in the anthracite region of Pennsylvania the past few years. At the present time there are eight large collieries at which all the water is hoisted, and six more plants are in preparation.

In the earliest regular hoisting by semi-cylindrical tanks at the Nanticoke collieries of the Susquehanna Coal Company the tanks were attached under the regular shaft carriages, taking in water through six large clack-valves in the bottom, and discharging through an end gate opened by a lever which was operated by a guide piece on the shaft head frame. The objections to their use were: That water could only be hoisted during the night shift, or when the shafts were not in use for hoisting coal, thus requiring a very large sump, and greatly limiting the water capacity of the plants; that the alternate wetting and drying of the shafts did considerable damage to the timber; and that the collection of ice in the main shafts, which are invariably down takes for the ventilation, endangered the men in going up and down in their work. These reasons, with the gradual increase of water beyond the capacity of the plant, led to the abandonment of this method of hoisting, so that now these tanks are used only in emergencies. The method was, however, one of the cheapest ever devised for handling a moderate amount of water from deep shafts, as practically the only cost was for the steam used, the extra wear and tear of engines, ropes, shaft guides and timbering, and the extra oil required for lubrication. The hoisting engineers being required by the Pennsylvania mine law to be in the engine houses at all times, and night firemen being necessary at all colliery plants, there is really no additional labor cost to this method of hoisting. These tanks have a capacity of 1300 gallons (174 cubic feet) each, and fifty per hour was an ordinary dump, so the total capacity, from a shaft 1000 feet deep, was about 750,000 gallons (8700 cubic feet) per day of twelve hours.

The present method of hoisting from a special water shaft or water compartment was first used in 1896 at the Luke Fidler colliery, Shamokin. The plan was the outcome of the successful use of tanks in unwatering the colliery, which had been flooded to subdue a mine fire.

The tanks were made to dump as in Fig. 1, and to

give the tank a slight tilt toward the third guide; this shoe slides on the guide, keeps the tank steady and in a vertical position until the dumping wheels, near the top of the tank, engage the dumping rail at the top of the shaft, and the tank turns gently, pouring its contents into the discharge basin. Another great advantage of the third guide is the steadiness it imparts to the tank and the smaller liability to accident from shaking the guides loose.

The original tanks were provided with a single, large, flat, clack valve at the bottom, which, in dumping, tended to swing to a vertical position and allow a small escape of water through it. This also struck the water very heavily in descending. The latest tanks are constructed with butterfly valves, set on a 45° angle, which entirely obviates the loss in dumping and enters the water as a wedge with a much less severe shock. (Figs. 3 and 5 to 8.)

To successfully operate these dumping tanks it is essential to arrange a rest in the sump on which the descending tank is supported while the upper tank is dumping. Without this the lower tank and rope may overbalance the upper tank, with nearly half its weight supported on the dumping track, and raise it sufficiently to reverse it in the shaft, and possibly do damage to the sheave.

As the usual dimensions of shaft compartments are about 7x13 feet, it is the general custom to use only one compartment for water hoisting (Fig. 2). This

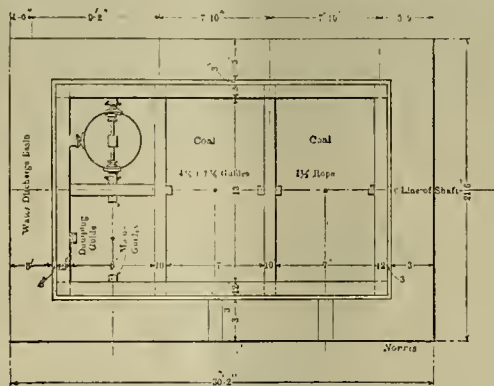


FIG. 2.

compartment is divided into two parts by an extra line of huntins (when discharging at the end of the shaft), or two sets of guides are put on the sides of the compartment, with the extra guides on the ends, when dumping at the sides of the shaft. The arrangement of two tanks in one compartment also reduces to a minimum the extra size and cost of shaft for water hoisting. The water hoisting engines are then usually set at right angles to the coal engines,

to avoid placing one sheave over the other, with the resulting extra liability to wrecks.

Bottom-dump tanks, instead of end-dumping ones, are exclusively used by the Philadelphia & Reading Coal & Iron Co., and also by our companies, as emer-

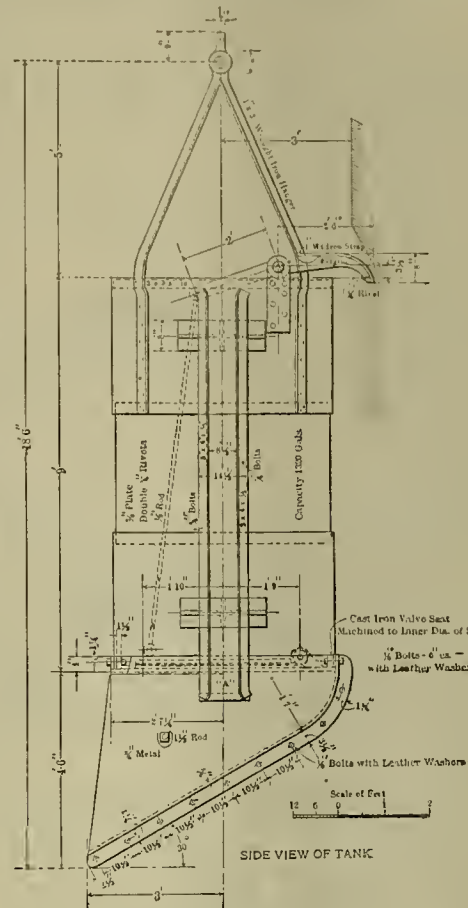


FIG. 4.

gency hoists in the coal compartments. These are generally constructed (Fig. 4) with the intake valve at the bottom, and are provided with a trip lever, operated by a guide in the head frame, to raise this valve at the top, and a discharge casting to direct the outflowing water to one side into the basins or troughs. The various types of discharge castings and valves in use are shown in Figs. 5 to 8. In all of

these it will be noticed that an effort has been made to reduce the blow incident to striking the water by the use of wedge-shaped castings. The Lytle Coal Co. use a wedge-shaped sheet iron shield, outside of the discharge casting, which reduces the shock still more.

The objections to this style of tank are its unsteadiness in hoisting at high speed, slower discharge through the bottom valve (the experience at William Penn colliery having shown an advantage of 10.1% in favor of the end dump), and, greatest of all, the danger of damage to guides caused by the slanting nose striking the water and consequent side pressure on the tank, which is intensified by the reaction of the water entering on one side only. In our experience with both types there has been practical immunity from trouble with the guides from the end-dump hoists, and almost constant difficulty with them when the bottom-dump tanks are used. One guide at the water level, forced out after thirty days' service, was cut into 1½ inch by the wear of the tank guides. The cast bottoms are also more liable to breakage from striking obstructions or floating timber than are the wrought iron tanks, the cast valve seats of which can be made heavy enough to withstand any ordinary hattering without unduly increasing the weight of the tanks.

The discharge casting (Fig. 7) is designed to minimize these difficulties. The plan is to make an open casting, which is a perfect wedge provided with a central partition, to take water in on both sides, and thus avoid the side thrust due to the slanting bottom and side entry of the water.

(TO BE CONTINUED)

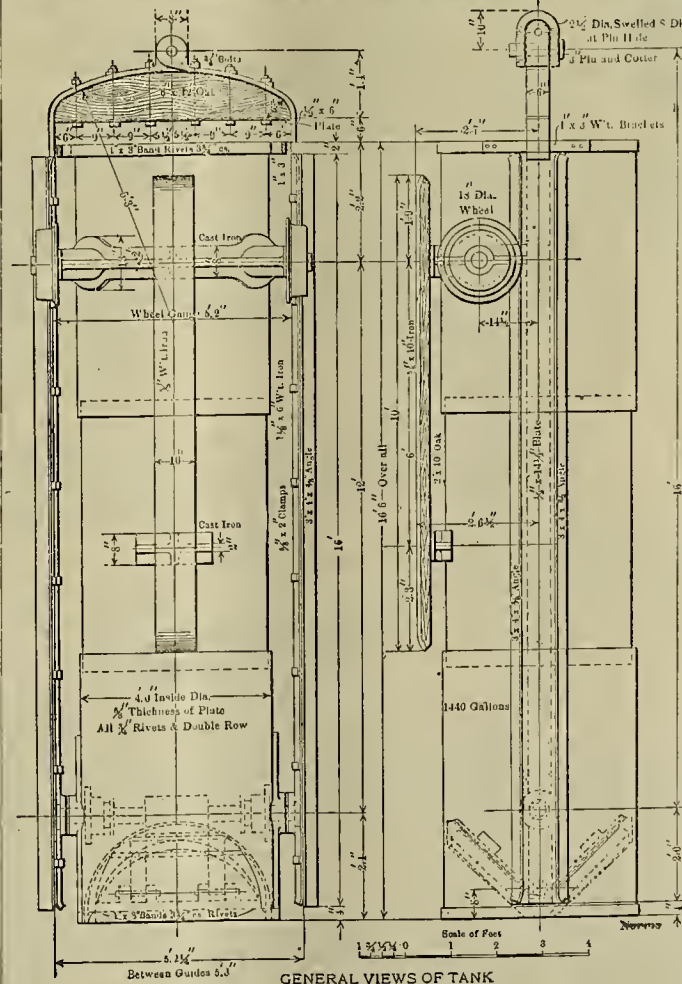


FIG. 3.

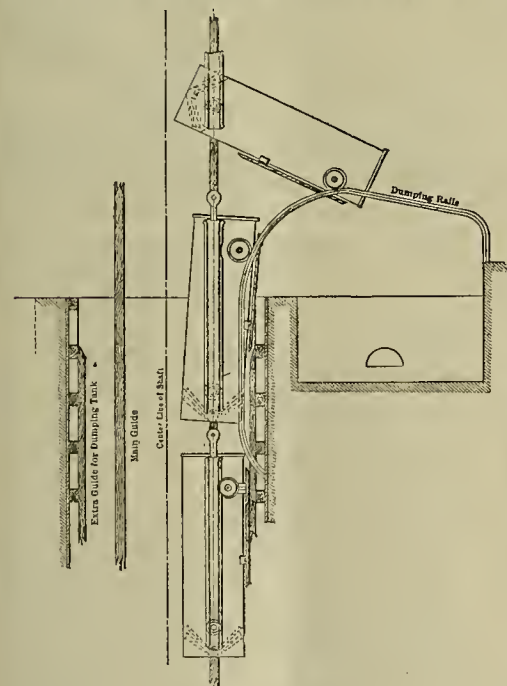


FIG. 1.

get the maximum size were made square with angle-iron corners; it was found almost impossible to keep them tight, and round tanks have been substituted.

The original method of dumping was the use of small wheels bearing against the guides to retain the tanks in a vertical position while hoisting; these passed through slots in the guides when the main dumping wheels reached the dumping rails (Fig. 1). These small wheels, if made of iron, rapidly destroyed the guides, and if of softer material only lasted for a few hoists. The present method of handling these dumping tanks is the use of a third guide (Figs. 1 and 2) at right angles to the main guides, and providing the tank (Fig. 3) with an extra shoe, set so as to

*Trans. Am. Inst. Min. Eng. (condensed).

Milling at the Camp Bird, Colo.*

NUMBER III.

By THOMAS H. WOODS and GONFREY D. DOVETON.

The master mechanic, W. Scheele, has arranged an excellent device for controlling the suction opening; it is a sliding valve, of boiler plate, set in a frame, and attached to the suction nipple by set screws. The slide is attached to a lever, which, in turn, is connected to a float. As the water rises in the settling box the valve is opened wider, and vice versa. This arrangement makes it impossible for the pump to take air, and the pump works very smoothly. A Cornish float was formerly in use, but it was not a success.

The cost of elevating the pulp, which settles in the leaching vats, amounts to $3\frac{1}{2}$ cents per ton, of which $3\frac{1}{4}$ cents is for power and $\frac{1}{2}$ cent for maintenance and repairs. A tailings wheel for elevating the tailings is under consideration, and, though the first cost will be large, the writers are convinced that this will speedily be balanced by the reduction in power, and the greater freedom from wear and tear.

The pulp is distributed in the vats by Butters and Mein distributors, which have been found satisfactory, the slimes passing off at three slime gates (fitted with slats 4 inches deep, set in a groove) placed at equal distances round the circumference of the vat. No attempt is made to classify the pulp before delivery to the vats, owing to the impracticable nature of the ground. The separation of the slimes takes place in the leaching vats, from whence they are conducted and settled in the slimes dam and stored for subsequent treatment, during the summer months. The leaching vats in the older portion of the mill are arranged for double treatment, and there are four sets of 100-ton vats and one set of 200-ton vats.

The bottom of the upper vat is set 4 feet 6 inches above the top of the lower. It rests on girders of channel iron, which, in turn, are supported on steel columns, in the center and around the circumference.

A series of experiments was conducted on 100-ton and 200-ton charges, to determine the adaptability of these tailings to single direct treatment, and the results were so flattering that, in a recent addition made to the mill, two vats, 40 feet in diameter, with a 6-foot stave, arranged for single treatment, were installed.

In the future additions to the mill, vats of even greater diameter, probably 60 feet diameter, will be installed, for single treatment.

Some comparative notes will be added to this paper relative to single and double treatment.

GRADING TEST.—A grading test of the product settled in the vats may be of interest:

(1) Product settled in a 24-foot vat, 100-ton charge.

(2) Product settled in a 30-foot vat, 200-ton charge.

(3) Product settled in a 40-foot vat, 300-ton charge.

Grading Test (1).—Two of these vats are filled at once, each vat getting about half the pulp.

	Per Cent.
Retained on 40-mesh.....	12.60
" " 60- ".....	22.90
" " 80- ".....	12.60
" " 100- ".....	.90
" " 120- ".....	19.10
" " 200- ".....	11.60
Passed 200- ".....	20.30

Grading Test (2).—This vat is filled alone.

	Per Cent.
Retained on 40 mesh.....	17.60
" " 60- ".....	22.60
" " 80- ".....	14.80
" " 100- ".....	1.60
" " 120- ".....	16.80
" " 200- ".....	16.00
Passed 200- ".....	20.60

Grading Test (3).—These two vats, used for single treatment, are filled singly.

	Per Cent.
Retained on 40-mesh.....	11.80
" " 60- ".....	22.60
" " 80- ".....	12.80
" " 100- ".....	1.00
" " 120- ".....	19.20
" " 200- ".....	10.00
Passed 200- ".....	22.60

The leaching vats are fitted with a filter bed consisting of pine slats $1\frac{1}{2}$ inches in width and 2 inches deep, placed $1\frac{1}{2}$ inches apart. In the wooden vats the slats are simply nailed to the bottom, and about against an annular ring slightly rounded on the periphery, and placed 1 inch from the staves. The slats are also rounded on the top, and, to admit of free circulation of the solution, crozed on the bottom at regular intervals. Over the slats is tacked a layer of cocoa matting, 2 inches smaller in diameter than the floor of the vat. A 12-ounce duck filter cloth, about 6 inches larger than the floor, is stretched over the matting, and firmly grouted

down with an inch rope between the ring and the staves. In the upper series of vats a heavier duck is required, the friction of the shovels being sufficient to wear out the cloth in about five months. In the lower series, however, an 8-ounce duck will wear for fifteen to eighteen months. The matting will last a considerable time—four or five years.

A No. 4 centrifugal pump is used for returning the solution from the pumps to the storage vats, or directly to the leaching vats. Zinc shavings are used as a precipitant, and the precipitating plant consists of four extractor-boxes, containing the strong solution. Each of these boxes is divided into six compartments 36 inches long, 24 inches wide and 28 inches deep. Three boxes, each with seven compartments, 30 by 30 inches and 36 inches deep, are employed on the weak solution. The waste solution, before leaving the mill, is passed through two zinc boxes of seven compartments each. All the boxes are fitted with side launders for the delivery of the zinc-gold slimes to the reduction tank. The gold liquor is drawn off from the top of the tank thoroughly clear, and no filters are required in the zinc boxes.

Sulphuric acid is used for the reduction of the precipitate, and after a thorough washing and drying they are melted into bars on the premises.

THE CYANIDATION.—(a) Double Treatment. After the charge has been sampled, leveled, and the requisite quantity of lime (found from acidity test on 100 grams of pulp) added, the cyanide solution is applied and allowed to percolate through the ore. A copy of the mill diary notes, taken during the treatment of a charge of tailings, will illustrate the current practice. It is to be understood that the treatment varies as changes in the nature of the ore are manifest.

Charge No. 127. Vat No. 5 (upper). Ore, 200 Tons.

Tons KCN.	Strength of KCN.	Day.	Hour.
30.....	.07%.....	June 9.....	10 A. M.
20.....	.25%.....	June 10.....	3 A. M.
20.....	.25%.....	June 10.....	5 P. M.
15.....	.25%.....	June 11.....	2 A. M.
25.....	.25%.....	June 12.....	1 A. M.
10.....	.25%.....	June 12.....	8 P. M.

At 3 P. M., June 13th, the charge was shoveled to the lower vat (No. 5). This required six men eight hours.

Charge No. 127. Vat No. 5 (lower). Ore, 200 Tons.

Tons KCN.	Strength of KCN.	Day.	Hour.
23.....	.30%.....	June 14.....	1 A. M.
10.....	.25%.....	June 14.....	3 P. M.
10.....	.25%.....	June 14.....	11 P. M.
10.....	.25%.....	June 15.....	8 A. M.
15.....	.06%.....	June 15.....	10 P. M.
20.....	.06%.....	June 16.....	11 A. M.
Tons Water.....			
20.....		June 17.....	2 P. M.

The charge was then allowed to drain until 2 A. M., June 18th. The residues, after sampling, were discharged by 10 A. M., June 19th.

Samples taken from the charge during the leaching period showed the following per cent of extraction:

Day and Hour.	Per Cent of Extraction.
June 10, 3 P. M.....	28.6
June 11, 3 P. M.....	42.4
June 12, 2 P. M.....	64.8
June 13, 2 P. M.....	74.2

The charge was then allowed to macerate twelve hours with a .30% KCN solution, and gave extraction as follows:

Day and Hour.	Per Cent of Extraction.
June 15, 7 A. M.....	76.5
June 18, 2 A. M.....	77.4

A final tailings sample was taken, just before discharging, which showed an extraction (by assay) of 77.25%. The rate of leaching, in the upper vat, varied from eleven gallons to seven and one-half gallons per minute. It was about fifteen gallons per minute in the lower vat (No. 5).

The values, as will be noticed, yield rather slowly to the solvent action of the solution. This is no doubt partially due to small particles of coarse gold, which are apt to be enclosed in the larger grains of sand. The system employed in charging the vats is to fill two of the 100-ton vats at once and the 30-foot and two 40-foot vats singly. A good deal of concentration goes on in vat No. 5, and the extraction percentage is correspondingly decreased. The extraction cited in charge No. 127 is below the average of the 100-ton vat extractions. It is due entirely to the elimination of a great percentage of the slimes, and is very much below the average extractions obtained in single treatment in the larger vats. The percolating solutions from all the vats are regularly titrated for free cyanide, and, when required, for total cyanide at least once every eight hours, and frequently several times in a shift. The titrations serve as a guide in controlling the treatment of each vat charge. A few of the titrations made on the outgoing solution from charge No. 127 show:

At 8 A. M. on the 10th of June, .01% free KCN and .03% total cyanide.

At 8 A. M. on the 11th of June, .09% free KCN and .15% total cyanide.

At 8 A. M. on the 13th of June, .19% free KCN and .195% total cyanide.

The large quantity of double cyanide found in the weaker solutions first coming from the charge is probably formed from the nascent HCN, liberated from the action of acid salts uniting with the zincate of potash contained in the working solution, to form zinc potassium cyanide.

The gold values in the solution show a gradual rise from a few cents at .005% test to their maximum value at .22—.24%, again declining to 20—35 cents per ton when the solution falls in cyanide to .03%—.04% when the residues are discharged.

A total consumption of cyanide of from 1 pound to 1.25 pound is found in double treatment; 0.7 to 0.8 pound is consumed by the cyanicides (chiefly copper minerals), about .125 pound is discharged with each ton of tailings, and about as much more, per ton of ore, is run to waste out of the mill, the combined gold being removed, in part, by the waste zinc boxes. A small amount is rendered inert, of course, during the precipitation of the bullion in the zinc extractor boxes, but a portion of the cyanide contained in the double salt of zinc is regenerated, when leaching, as potassium or sodium cyanide. The consumption of cyanide due to zinc precipitation is usually so small that it is scarcely appreciable.

A great deal of cyanide is consumed after the charge has been shoveled to the lower vat, and the solution applied. This is probably due to the oxidation of some of the cupriferous minerals. The consumption in the single direct treatment system is approximately 0.7 pound per ton, about .35 to .45 pound of which is due directly to the presence of cyanicides in the tailings; the remainder is lost by dilution and by the discharging of a certain amount with the residues. The lower consumption is solely due to the fact that there is no shoveling, and consequent aeration and oxidation of the baser minerals.

Exhaustive experiments on a large scale have recently been carried out with a view of recovering the cyanide contained in the waste solutions. It was clearly demonstrated that a large percentage of the free cyanide, and that combined with the zinc, could be recovered with ease and profit, and converted into an effective extracting solution.

The cyanide that combined with the copper could also be recovered cheaply, but, in view of the low chemical consumption obtaining, it was not deemed advisable to install a "recovery" plant.

SINGLE TREATMENT.—(b) The treatment of the tailings is carried on much in the same manner in single as in double treatment. The solution, usually 0.25% KCN, is kept in circulation for seven or eight days, or until the assays of samples, taken at regular intervals from the charge, show that an adequate extraction has been obtained. When the vat is filled, care is taken not to drain the charge of more water than sufficient to enable the sampling and leveling to be done comfortably. It seems of importance to allow the particles of sand to be surrounded with a "water cushion." If the charge is completely drained before applying the solution, the sand packs tightly, and subsequent leaching operations are much retarded. No vacuum is employed in either of the systems, as no difficulty occurs in obtaining a good rate of percolation.

An example, illustrating the single treatment, is copied from the mill diary, and the percentage rate of extraction after certain periods may be of interest.

The charge—No. 267, vat No. 6, 300 tons—was filled at 9 A. M. on December 29, 1891, and after sampling and leveling and adding the requisite lime, forty tons of .06% KCN were applied at noon, and also at 10 P. M. of the same day. A .25% solution of KCN was then applied, and kept in circulation for seven days, with occasional periods of maceration. The charge was then allowed to remain in contact for twelve hours, drained partially, and weak washes of .06% KCN, amounting in all to sixty tons, were applied. (The solution washes are run on till the vat is filled to the brim, thus making use of the slight head obtained to aid percolation). When the weak solution had drained sufficiently, about thirty-five tons of water were applied, and by midnight of January 8, 1902, sufficient cyanide was removed to allow of the residues being sampled and discharged. The actual time of treatment was eleven and three-quarters days, and assays taken from the pulp during that time, at intervals, show the following rate of extraction:

No.	Time.	Per Cent Gold.	Per Cent Silver.
(1)	1 P. M. Dec. 30.....	12.40	4.00
(2)	3 P. M. Jan. 1.....	53.60	21.20
(3)	2 P. M. Jan. 3.....	68.00	42.60
(4)	2 P. M. Jan. 5.....	77.50	50.00
(5)	4 P. M. Jan. 7.....	85.00	57.00
(6)	12 M. Jan. 8.....	85.70	63.00—Final tailings.

The rate of percolation on this vat charge was about seventeen gallons per minute for the first couple days, and gradually slackened to from ten to twelve gallons near the end of the treatment. The total quantity of solution received, including water washes, 340 tons, or 1.13 ton per ton of tailings.

(TO BE CONTINUED.)

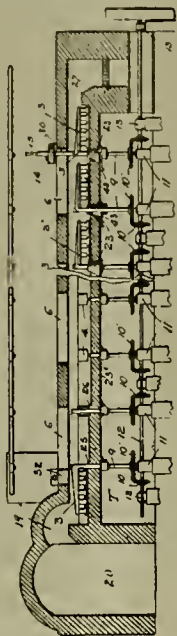
*Trans. Am. Inst. Min. Eng. (condensed).

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 14, 1903.

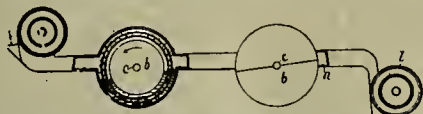
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

FURNACE FOR ROASTING ORES.—No. 725,056; T. Edwards, Ballarat, Victoria, Australia.



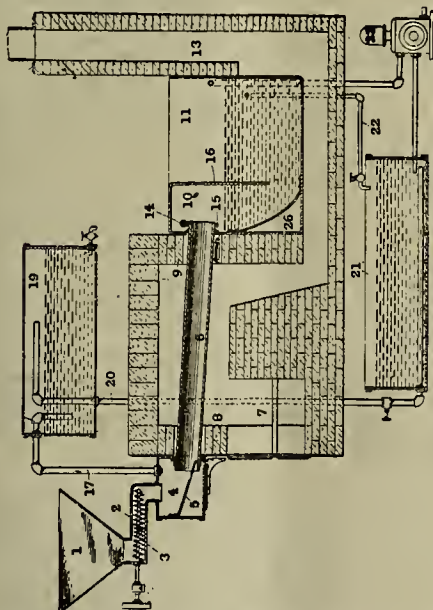
In combination with elongated reverberatory furnace, tunnel under hearth thereof, hearth having openings extending therethrough, sleeves within openings, air regulators for controlling passage of air through sleeves, rables within furnace having stems projecting downwardly through sleeves and having hollow stems projecting upwardly, line shaft in tunnel, gearing between line shaft and stems of rables, means for supplying rables with cooling medium through hollow stems.

AMALGAMATING MACHINE.—No. 725,309; A. H. Woodruff, Chicago, Ill.



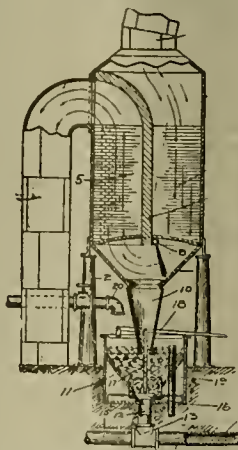
Combination with amalgamating cylinder, foraminated, superimposed cylinders, on amalgamating cylinder, longitudinally separable into halves.

APPARATUS FOR TREATING ORES.—No. 725,321; S. C. C. Currie, New York, N. Y.



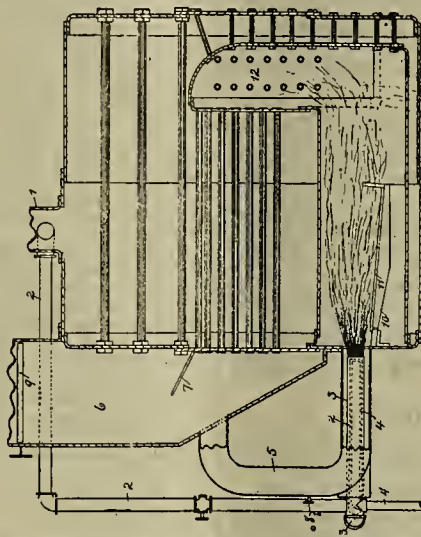
Ore hopper and conveyor leading therefrom, closed chamber into which conveyor empties, incline in chamber leading material from conveyor to inlet end of heating drum, heating drum and means for conveying steam to delivery end thereof, whence it passes through drum to closed chamber, and escape pipe from closed chamber.

APPARATUS FOR COLLECTING AND SEPARATING IMPURITIES FROM METALLURGICAL FURNACE GASES.—No. 725,352; E. J. McAleer, Sharpville, Pa.



Apparatus for removing impurities from blast furnace gases and collecting impurities, comprising combination with separating chamber having inlet and outlet openings, open passage for blast furnace gases through chamber formed by walls of separating chamber and centrally disposed dividing wall, fluid supply located in separating chamber through which gases pass, tank below separating chamber into which fluid and impurities from gases fall, and valve for controlling discharge from tank.

APPARATUS FOR BURNING OIL FUEL.—No. 725,408; J. S. Chapman, Albany, N. Y.



Apparatus for heating steam boilers by use of fuel, consisting of conduit to convey portion of inflammable waste gases from uptake of boiler to firebox; air conduit inside waste gas conduit arranged to convey air under pressure to firebox, terminating inside short of exit end of waste gas conduit; steam conduit inside of air conduit terminating inside and short of exit end, air conduit arranged to convey and discharge steam into firebox; oil conduit inside of steam conduit and terminating inside and short of exit end of air conduit, arranged to convey and discharge oil into the firebox, all arranged and operating so that the oil, air and steam discharges combine, produce suction in waste gas conduit and draw waste inflammable gases from uptake, so oil discharge be compelled to pass centrally into rapidly moving steam discharge, both oil and steam discharges into air discharge and these combined into waste gas discharge, having means for controlling discharges.

MINER'S TOOL.—No. 725,420; A. V. Des Moines, Silver Plume, Colo.



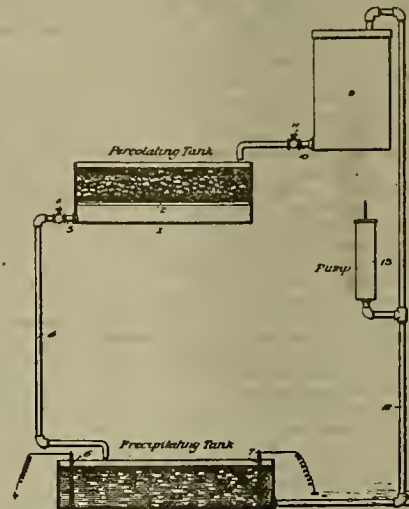
A miner's tool, comprising pivoted members, one of which is provided with opening or space, the other formed with spaced notches, and lance having slotted shank slidably confined in space of member and provided with locking projection arranged to fit into either of notches of other member.

PROCESS OF TREATING COMPLEX ORES OF ZINC.—No. 724,637; W. C. Wetherill, Canon City, Colo.

Method of recovering precious and other valuable metals from zinc-bearing ores with which they are associated, by associating with ores sufficient quantity iron to render metals (by resulting combination) susceptible to magnetic separation, reducing and dis-

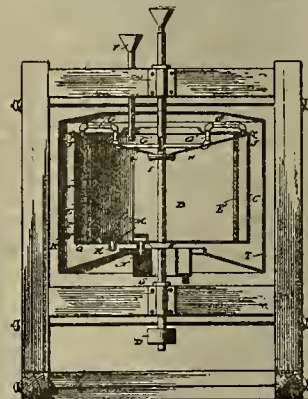
tilling zinc by aid of excess carbon in closed retort, thereby producing carbonaceous residuum containing iron in association with metals to degree sufficient to render latter magnetic, crushing residuum, and separating magnetizable precious and other valuable metals therefrom magnetic by attraction.

PROCESS OF EXTRACTING COPPER FROM CARBONATE AND OXIDE ORES.—No. 725,548; H. R. Ellis, Salt Lake City, Utah.



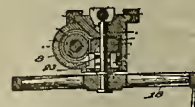
Process of extracting copper from carbonate and oxide ores and material carrying carbonate or oxide of copper, treating ores or material with aqueous solution containing mixture of carbonate and bicarbonate of soda and carbonate of potash.

CENTRIFUGAL LIXIVIATING MACHINE.—No. 725,549; H. R. Ellis, Salt Lake City, Utah.



Combination of hollow rotary shaft, drum mounted thereon, perforated partition within drum, arranged concentrically with periphery of drum and located at such distance therefrom as to form annular chamber about perforated partition, filtering medium on inner face of perforated partition, radial supply tubes communicating at inner ends with hollow shaft and at outer ends with annular chamber, means for supplying liquid to hollow shaft.

ROCK DRILL.—No. 725,227; L. E. Decker, Chattanooga, Tenn.



Combination of support, drive shaft, plunger provided with rack teeth, mounted to reciprocate in support, spring adapted to be compressed to project plunger, gear wheel in mesh with rack teeth on plunger for retracting same and compressing spring, drive shaft on which gear wheel is loosely mounted, radially movable dogs carried by shaft for engaging gear wheel to lock same thereto, and means for retracting dogs to release gear wheel.

PROCESS OF EXTRACTING BROMINE.—No. 725,161; A. W. Smith, Cleveland, Ohio.

Treating bromine-laden gas to action of alkaline carbonate and subject resultant gases to action of absorbent for carbon dioxide.

GOLD EXTRACTION PROCESS.—No. 725,257; T. B. Joseph, Mercur, Utah.

Process of extracting gold and silver from ore containing same, when in suitable condition, which consists in subjecting ore to leaching action of solution of water, cyanide of potassium, bromine, hydrate of calcium and carbon dioxide, intimately mixed, simultaneously agitating ore by compressed air forced upward through same.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence).—The report of big pay having been uncovered on bench off No. 2 Daniels creek has been confirmed; so also a paystreak 20 feet in depth and unknown width on Tripple creek; also a body of pay gravel on MacDonald creek, a tributary to Nome river, both of the latter undoubtedly on the old beach line. Work is progressing favorably on Anvil and Dexter, Kelly's pumping plant is being erected, supplies are being hauled to the creeks, and everybody seems to be active.

On Mystery creek, a tributary of Shovel, a number of camps are busy taking out dumps, also on Solomon river.

On Peluk creek a number of dumps are being taken out which should add to the winter output of gold of Nome.

The reported strike on Shantuk, a tributary to the Kobuk, about 600 miles from here, is not as extensive as reported, although as there is timber and small game in that section of the country it is better for the prospector.

Since gambling has closed down a number of gamblers went to work on the windlass, and although the town seems deserted, yet it is a step in the right direction, the gambling element will leave the town and the prospector and miner will be the gainer. Some business houses are affected by the closing down of the games, mostly restaurants and furnishing establishments.

The fire of two weeks ago burned the Dexter, Warwick and Bodega buildings, causing about \$15,000 damages. The volunteer fire department had to work like Trojans, with the temperature 40° below zero. The citizens of Front street subscribed the sum of \$1000 to be divided among the volunteers, besides putting a gymnasium into their headquarters.

The temperature has been low all winter; again the temperature is down to 40° below zero. Since Dec. 17 the temperature averaged 25° below zero; it is the coldest winter Nome has experienced in its four years of existence.

Nome, Feb. 8.

(Special Correspondence).—Good pay is being found on Solomon river, large dumps being taken out from benches extending from Big Hurrah to Shovel creek. A big strike is reported from an old channel of Willow creek, tributary to the Cassa de Pago river, off No. 7 above. Details are lacking.

Nome, Feb. 15.

J. Barnette, founder of Fairbanks in the Tanana mining district, is at Skagway and says when he left, on March 22, there were 243 buildings under construction at Fairbanks and the population was 800.

J. A. Garoutte of the Mlocene Ditch Co., near Nome, says their tunnel between the head of Snow gulch and Anvil is nearly finished. Twelve men are at work on the tunnel and it is expected water will be turned on next month.

ARIZONA.

GILA COUNTY.

At the Old Dominion mine at Globe the four-compartment shaft is down 110 feet. Two steam hoists will soon be used in sinking. Two sinking pumps of 600 gallons per minute capacity each were received last week, one being placed in the old shaft and the other reserved until needed in the new shaft. Arrivals of coke tax the capacity of the smelter bin.

Thompson, Barclay & Lund have a lease on the Golden Eagle mine, 1 mile northwest of the Black Warrior plant and southeast of the Sultan group of gold mines, near Globe.

D. D. Sullivan has a lease from the Old Dominion C. Co. on the New York & Chicago copper mine, near Bloody Tanks, 6 miles west of Globe, and has men at work.

The pumps and machinery at the Malory shaft, on the Globe-Boston group, near Globe, are being overhauled and put in shape preparatory to cutting the station and starting the crosscut tunnel at the depth of 450 feet in the shaft.

GRAHAM COUNTY.

(Special Correspondence).—In Greenlee district, 6 miles northwest of Clifton, G. W. Williams et al. are working the Senator mine and have a tunnel in 240 feet. The first vein cut is 9 feet wide and the second 15 feet. The ore runs \$6 in gold and 4% copper. The face of the drift is 175 feet under the Red Giant and Mother Lode. They also have five claims in the Laura D. group. One of the leads yields as high as \$128 per ton by arrastra treatment.

Clifton, April 20.

The Review says native copper has been struck in the Arbuckle mine, which adjoins the Antietam mine, near Clifton.

A gasoline engine and hoisting plant are being put up by the Coronado M. Co. on the Sapphire mine, near Clifton, where the company will sink a 500-foot shaft.

MARICOPA COUNTY.

R. Christenson of London, Eng., has bonded the Mountain View group of three claims and a millsite on the Black Canyon road, north of Phoenix. The lode is 10 feet wide, averaging \$10 per ton in gold, and the country rock is granite.

MOHAVE COUNTY.

(Special Correspondence).—J. Carroll reports silver ore on a claim between the Juno and Mormon Girl mines, near Chloride, assays of which show fifty-eight ounces to the ton.

At the Emerson mine the shaft is down 80 feet and the vein continues 8 inches wide, with gold values. A pumping plant will be put in.

The mine and mill at the Tennessee resumed last week. A contract has been let for drifting 100 feet on the 500-foot level and the main shaft is being sunk deeper. Stopping on the 200-foot and 300-foot levels is breaking ore for the 100-ton mill. The Elkhart mill is crushing ore from the 500-foot level.

The Redemption mine shipped half a carload of its high-grade gold, silver and copper ore this week. The tunnel is in 55 feet.

The Jack Flynn gold claim, on the south extension of the Samoa mine, has a quantity of ore on the dump ready to ship, which averages five and one-half ounces to the ton. Silver-bearing lead ore is coming in.

The Fraction mine, owned by Hughes & Mitchell, shipped four tons of ore to the smelter this week.

The shoot struck by O'Shea & Dempsey, 9 miles west of Chloride, is showing eight-ounce gold ore at a depth of 14 feet, in limestone.

T. McNeely made a shipment of ore from his mine on the summit of Sherwin's peak this week. Sixty feet of work in sinking has been done. The principal values are in silver, with some gold and copper.

The Lone Star mine at Mineral Park is being successfully worked by lessees.

At Cerbat several mines are shipping ore.

It is reported that a shoot of silver ore has been struck in the Earl mine at Stockton Hill.

It is understood that the mines at White Hills will be operated on the leasing system.

Chloride, April 21.

The main shaft of the Queen Bee mine, Mineral Park, has been sunk 30 feet below the old level and three shifts are at work.

Last week Superintendent T. McNeely shipped a 20-ton car of ore from the Argo mine, near Kingman, to the smelter. The ore carries values in silver and lead.

At the Gold Road mine, near Kingman, the mill is expected to be in operation next week. All the machinery is in place. It is estimated there are 100,000 tons of \$15 ore blocked out in the mine and in the ore bins. In the bottom of the main shaft on the Gold Road the ore averages \$20. Recently the company leased a part of the Gold Line to two men, who are taking out ore that averages \$60 per ton. This ore the company will treat in the mill.

PIMA COUNTY.

(Special Correspondence).—The Tucson S. & R. Co. has bought the Copper King group of mines, 14 miles southwest of Tucson in the Tucson mountains. They will erect a smelter. In one of the main tunnels they have a body of ore that runs 20% in copper. They have twenty-four claims in all. The property is now developed will produce fifty to sixty tons per day. W. W. Robinson is manager.

The Catalina Copper M. Co., operating the Catalina group of mines in the Catalina mountains, will put in a pump, hoist and drills; also intend erecting a smelter. They report having 75,000 tons of sulphide ore blocked out, averaging 7% copper, \$2 in gold and \$2 in silver; have 4000 feet of development work on the property. There are fifteen claims in the group. F. M. Hartman is manager.

The Gould group, 12 miles west of Tucson, have one shaft on No. 5, 60 feet deep, all in low-grade ore; No. 1, 50 feet deep, the last 30 feet in ore running 15% copper; one tunnel in 65 feet, the breast sampling 16% copper, \$1.50 gold, four ounces silver. S. H. Gould is manager.

Tucson, April 20.

PINAL COUNTY.

(Special Correspondence).—Pinal Paraffine Oil Co., near Kelvin, have their well down 1200 feet and claim to have struck a good grade of paraffine oil, but not in paying quantities as yet.

The Roy mine is owned by an English

syndicate, who are doing development work. Their mill is at Kelvin, 5 miles distant. Mine and mill are connected by narrow gauge railroad. The Troy-Manhattan Co. intend erecting reduction works on their property at Kelvin.

Kelvin, April 20.

YAVAPAI COUNTY.

Manager B. Blanchard of the Iron King mine, southeast of Prescott, says he is working 100 men; the mill has been inclosed; the 1½-mile water pipe line from the Agua Fria is half completed; a pumping plant will force water from the river to the mines; an air compressor and other machinery is on the ground. Ore is being shipped to the smelter. A drift from the 100-foot level is in 1140 feet; crosscutting and blocking out ore is the main work being done; the three-compartment working shaft is down 40 feet; an electric plant will be put in.

M. Greer reports finding, three-quarters of a mile northwest of Brodie's Crown Point mine, near Prescott, a ledge 14 feet in width, which assays \$80 in gold and silver.

Manager E. M. Clark of the Chicago G. M. Co. has put in at the company's mine in Groom Creek district, 6 miles south of Prescott, a 40 H. P. boiler, hoist and pump and resumed development. G. Woods is superintendent. The shaft will be sunk to 500 feet and drifts run.

The Prescott Courier says the Gold Link M. Co. operating the Sultan group of mines in Santa Maria district, near Prescott, has the frame work for its 20-stamp mill up. A sixty-ton per day cyanide plant will also be erected. There are 35,000 feet of development work on the Sultan mine, the average value of the ore being \$20 a ton gold.

CALIFORNIA.

CALAVERAS COUNTY.

The Lamphear quartz mines, south of Mokelumne Hill, will be started up next week under Superintendent J. E. King. A new shaft will be sunk. The mine has been prospected to a depth of 300 feet.

J. M. Evans, superintendent of the Forty-nine placer mine, has a bond on a group of gravel mines near Douglas Flat and is arranging to begin work. On the Forty-nine mine he has put up a pumping plant.

At the Salvator quartz mine on Esperanza creek, near Jesus Maria, work in the tunnel is in progress. An upraise is being run, ore blocked out and ten stamps are dropping in the mill.

The first payment on the Lloyd gravel mine at Central Hill, near San Andreas, recently bonded to H. H. McIntyre et al. of Boston, Mass., was made last week. Development work is in progress.

The Gold Cliff mine of the Utica Co. at Angels is being operated with oil as fuel. The oil is pumped up to the tank on a hill 60 feet high, from which it runs direct to the furnace.

Baumhoger Bros. at Altaville, near Angels, have consolidated their mine with the Eastern and Great Eastern and will work them through the Baumhoger shaft.

EL DORADO COUNTY.

The 10-stamp mill on the Tincup mine, near Placerville, is being removed by J. C. Sullivan and set up at the Jasper mine on Webber creek.—The Rustlers' M. Co. will put a mill on the Gamecock mine, says the Nugget.

KERN COUNTY.

The Associated Oil Co. is shipping oil from Kern River field, near Bakersfield, and from McKittrick at the rate of 10,000 barrels a day. They are providing additional storage of 650,000 barrels capacity. One earthen reservoir has been contracted for, to contain 400,000 barrels, in the Kern River field, and another to hold 250,000 barrels, in the McKittrick field. This last will be lined with brick and cement. The company is keeping three drilling rigs at work, says the Reporter.

The Alameda Oil Co., at Sunset, is drilling wells Nos. 4, 5 and 6. The first of these is in sand, the second is down 600 feet and the third 200 feet, and No. 7 is rigging. The Elk has its No. 2 down 1050 feet; the Arcola No. 3 is at 500 feet; A. C. King & Co. are down 750 feet; the Four Hundred Oil Co. 1150 feet and the Sunset Center 650 feet. The Chico, 10 miles south of Sunset, is increasing the depth of its well from 1200 to 1500 feet. The Sunset Asphaltum & Refining Co. has begun work on its refinery at Sunset. Part of the machinery is on the ground.

The Kramer Con. Oil Co. has resumed at Hiawatha, near Randsburg, and expect to deepen 1000-foot hole to 1500 feet.

MARIPOSA COUNTY.

Six stamps are to be added to the 4-stamp mill of McCarthy & Soderberg at Kinsley.

The Hite mine, Jerseydale, has been leased to Arkell Bros. and five stamps are dropping in the mill.

NEVADA COUNTY.

Preparatory work for putting in ten more stamps at the mill of the Union blue gravel mine, at North Bloomfield, has begun, says Superintendent Gassaway, and it is expected to have them dropping by July 1.

The Peabody mine, near Grass Valley, is being unwatered, after being closed down for ten years. J. C. Roberts is superintendent and C. Christopher of Seattle, Wash., is manager. The company will use oil for fuel. The boiler capacity of the plant has been increased, and a 45 H. P. hoist, capacity for 1500 feet depth, put in. The mine is opened by two incline shafts 600 feet apart, the north or main one being down 450 feet. After the water is out, a compressor and machine drill will be put in.

Superintendent W. H. Martin of the Sierra Queen, near Nevada City, reports development work progressing. A station is being cut at the 420-foot level, after which drifts will be run north and south on the ledge. With this completed, sinking the shaft will be resumed. He also says the mill on the Mayflower mine, at Canada Hill, of which he is principal owner, will be started up.

Work on the Alta-California gravel mine, near Grass Valley, under bond to G. W. Root, manager of the Grass Valley Con. Co., will begin next week.

Thirty men started work last week at the Hudson mine, near Rough and Ready, on the construction of a ditch which will convey water for power to operate the Hudson and Niagara mines.

M. D. Colley, owning the Ocean Star and several other quartz claims near Ormonde, in Washington mining district, has bonded his properties to the company operating the Red Cross mine at Omega, near Washington. Development work will begin next week.

J. Rehar of San Francisco has bought a one-third interest in the Sailor Boy mine near Nevada City.

PLACER COUNTY.

The Never Sweat mine, near Westville, is being worked by Denton & Dodds.—The Herman mine, near Westville, recently sold to J. B. Hanna et al., is expected to start this week. The company intend to increase the number of stamps from twelve to twenty-two.

PLUMAS COUNTY.

The Johnny Bull, in North canyon, S. Firmstone superintendent, has its hoisting works in operation and stations are being cut at several levels. The mill is being overhauled.—The Round Valley Con. Co. will be started up as soon as the roads permit.—The cyanide works are near completion, says Superintendent F. Wheelock of the North Canyon M. & R. Co., near Beckwith.

The Feather River Con. M. Co. has taken on more men, all of whom are engaged in digging a canal to carry water to the cement mill at Iron Bar, near Spanish Ranch, says the Independent. This canal is 10 feet wide on the bottom and will carry 3 feet in depth of water, which will operate a 21-inch horizontal cased turbine wheel, capable of generating 43 H. P. Lumber is being hauled from Gansner's mill to Iron Bar for the erection of a mill building, reservoir, etc. In cutting through a body of cemented gravel in digging the water ditch the gravel showed gold values.

SAN BERNARDINO COUNTY.

The St. George group of mines is expected to begin operations next week. This property is under bond to C. H. Thompson et al. It is in Vanderbilt, 4 miles from Manvel.

SANTA CLARA COUNTY.

The Alberta Oil Co. at Sargents began drilling last week ½ mile west of their former site.

At the Statton quicksilver mine, near Hollister, Superintendent S. Smith has men at work. A furnace will be erected next month.

The Chapman quicksilver mine, near San Jose, is reported sold to R. B. Harper, manager of a company of Boston and New York men. The new owners will spend \$100,000 in machinery and development work.

SHASTA COUNTY.

The management of the De Lamar smelter at Bully Hill (Winthrop P. O.) report the smelter will be started up again May 1st, having been closed since October, 1902.

The Quinby Creek M. Co., operating near Redding, are planning to erect a 20-stamp quartz mill. Manager Beall, formerly superintendent of the Bully Chooch mine, says a wagon road will have to be built that machinery may be hauled in. Fitch, Cunningham, Cronin & Beall are the owners.

SIERRA COUNTY.

M. H. Mead, manager of the Keystone mine, 3 miles south of Sierra City, says

pay ore has been struck at a depth of 600 feet below the old workings. A tunnel has been run for 4500 feet. Sixteen men are at work and more will be added next month. A mill will be erected in the summer.

SISKIYOU COUNTY.

A. W. Williams, owning the Indian Girl mine, on Klamath river, has bought the Blue Gravel mine, near Yreka, and will reopen it.

TRINITY COUNTY.

M. Manley, superintendent of the Enterprise mine, on the East Fork, near Trinity Center, says a sawmill is being erected and work will begin this summer on a 20-stamp mill. The 10-stamp mill now on the property will resume next week.

R. Hicks, superintendent of the Bobs Farm mine, near Junction City, says operations will resume next week.

TUOLUMNE COUNTY.

H. W. McPherson of Los Angeles has bought the Maud and Last Chance mining claims at Hall's crossing of the Stanislaus river, 2 miles north of Confidence, for \$1000.

At the Grizzly mine, near Carters, the raise is finished from the tenth to the ninth level, and drifting into the shoot has begun.

At the Mohican mine, near Groveland, Superintendent F. Chappellett has sixty-five men at work—thirty-five on the new road to the top of the hill. At the mine gold quartz is being taken out and the mill is running steadily. A station is being cut out 300 feet in on main tunnel No. 1, where the hoist will be set up. The excavation for the compressor to run the machinery is finished.

J. R. Johnson has bought the pocket mine in Buchanan district, south of Carters, says the New Era, and will open up the drift and crosscut.

The Starr King mill, near Carters, was started up this week by Superintendent C. A. Holland.

Drifts are being run north and south from the 1000-foot level of the Grizzly mine, near Carters.

Work has been resumed in the Mayflower tunnel, near Groveland, to tap the channel, after a temporary shut-down caused by a breakage to the machinery.

The Little Beauty mine at Arrastraville, near Carters, is being reopened by F. Cook and C. F. Fox.

Superintendent J. F. Gilles of the Sierra G. M. Co. says the work of putting the hoist and machinery in condition at the Del Monte mine, near Groveland, is nearly complete. The damage done by the recent fire was not so serious as at first thought and operations will resume next week.

YUBA COUNTY.

The Eymard estate, on the north bank of the Yuba river, 9 miles east of Marysville, has been sold to W. P. Hammon & Co. for \$90 per acre. This tract was deeded to the United States Government for a right-of-way for debris barriers, the right to extract mineral, however, being reserved. It is the mineral rights which Hammon & Co. have bought, and dredgers will be used. A prospecting drill will be put on next week.

COLORADO.

BOULDER COUNTY.

At Sugar Loaf the Tungsten is shipping thirty-five tons of ore daily under the management of W. F. Rowen. They are working twenty men. The Recluse at Sugar Loaf, which has been idle for several years, has resumed. They will sink a vertical shaft and put in a plant of machinery, says the Boulder Miner.

Superintendent J. A. Jester has resumed work at the North Western mine at Caribou. The shaft is down 190 feet and several levels run.

CHAFFEE COUNTY.

Ore has been found in the Newitt mine, at Newitt, east of Buena Vista. The find shows a 35-foot vein at a depth of 265 feet in the lower level. A narrow shoot runs 2000 ounces silver. B. F. Morley of the Buena Vista smelter has a lease on the mine. Arrangements are being made to ship a car of ore a day to the smelter.

CLEAR CREEK COUNTY.

Manager Tingle has made the second installment in payment for the Highland Laddie and Centralia claims on McClelland mountain, in East Argentine district, near Georgetown, and adjoining the Santiago claims. It is locally reported the Waldorf M. & M. Co. is the real buyer. The management is arranging for the erection of concentrating plants to treat their low-grade ores.

The Specie Payment mine, on Bellevue mountain, near Idaho Springs, has resumed and contracted with the Bonieta mill for handling their ores. An air compressor is being set up at the Lucania tunnel and driving towards Bellevue mountain will resume. This tunnel will cut the Specie Payment mine in 3000 feet and at a depth of 2000 feet. Colorado Springs men are at the head of the Lucania tunnel. At present they are sinking a shaft in Russell gulch to connect with the tunnel for an air shaft.

The Hazleton M. Co. are putting in machinery at the Baltimore mine, near Silver Plume, says the Standard. The tunnel will be driven ahead to cut the Shively and other veins, and the shaft on the Baltimore vein will be sunk farther.

Manager Hartshorn of the Pacific mine, near Georgetown, reports their ventilation fans and power plant in operation. Electric drills will be put into the mine. Construction work for the mill at Yankee has begun by the Yankee Con. M., M. & T. Co., of Denver. The initial capacity will be fifty tons per day, but the building will be made large enough to double the capacity, which they expect to do next summer.

FREMONT COUNTY.

The Portland Cement Co. of Florence has bought 2000 acres near Coaldale, in the western edge of the county. On the land is a deposit of gypsum. The company proposes to use this gypsum for the manufacture of cement and plaster of Paris. A road will be built connecting the main line of the Rio Grande Railroad and the gypsum bed, a distance of 2 miles.

GILPIN COUNTY.

The Rex group of eight claims, in Gamble gulch, near Central City, have been sold to the Black Diamond M. & D. Co., composed of Detroit, Mich., men, for \$20,000. The property is partially developed by the Rex tunnel, which is in 150 feet from Gamble gulch slide. Operations have begun with G. D. Kaye of Boulder as superintendent.

The Rhoderick Dhu G. M. Co. has incorporated to develop the Rhoderick Dhu and Protection claims on Quartz hill, near Nevada, above Central City. The incorporators are L. G. Haunstein, W. G. Cover and L. F. Butler. J. C. Fleschutz is manager. The workings will be equipped with a hoisting plant capable of extracting the ore to a depth of 1000 feet.

McFarlane & Co. of Black Hawk have men at work on the main building of the Gregory-Buell, where a 45-stamp mill is being placed. The stamps will be of the slow-drop pattern. Contracts will be given for 1000 feet of machine driving. Upraises will be made to connect with the bodies of low-grade ore, the higher grade ore in the meantime being shipped to the custom mills, sampling works and smelters.

E. C. Miles of Denver, of the Edna and Mida G. M. Companies, says they will erect a 20-ton amalgamating and concentrating plant at the junction of Russell and Lake districts, near Russell gulch. It is the intention to have the plant in operation by June 1st.

Idaho Springs parties have a lease and bond on the Stacy group, near Rollinsville, and have begun operations. There is a tunnel in 125 feet and a number of shafts. J. Knowles, formerly of the Newhouse tunnel at Idaho Springs, is superintendent.

GUNNISON COUNTY.

The Porcupine group of five copper claims on South Gold hill, near Pitkin, have been sold for \$9000 to Waterbury & Adams of Denver. The workings consist of a tunnel in 1100 feet and an incline shaft down 120 feet on a 9-foot vein. At 450 feet from the south entrance of the tunnel a 4-foot vein is exposed, carrying \$8 in gold and silver, the walls being porphyry. At 600 feet a 12-foot contact vein is showing, the ore running 5% copper and \$2 in gold and silver.

HINSDALE COUNTY.

A strike of gold is reported made last week in Larson gulch, near Lake City, and a rush to that section has started, many claims having already been staked. H. Karl, W. C. Butler and L. Dubois cut a 4-foot vein, the ore assaying five ounces gold and 170 ounces silver.

LAKE COUNTY.

Manager Chauvenet of a company of Denver men has begun work on the California Gulch placer ground, near Leadville, beginning below Bucktown and extending west 4000 feet. Seventy-five acres, mostly in the basin of California Gulch, have been leased. A drilling outfit is prospecting the ground and a dredger will be put in this summer.

At the Bartlett mine on Sugar Loaf mountain, near Leadville, the tunnel is in 800 feet with 500 feet yet to drive before striking the veins for which the tunnel was started. This is expected to be finished by August. An air pump has been put in and connected with the turbine water-wheel, which is operated by the water running out of the tunnel. During the last three months the smelters have reduced treatment charges on Sugar Loaf ore from \$9 to \$4. This treatment applies

to siliceous ores carrying fifteen to twenty ounces in silver and from \$2 to \$3 in gold. With this schedule many properties on Sugar Loaf will be able to operate during the summer at a good profit.

Manager Nicholson says the Coronado shaft at Leadville has been unwatered and a crosscut will be driven to connect with the Midas. The Midas mine, now being drained by the Penrose, will, when connection is made, be drained directly by the Coronado.

The Iron Silver Mines Co. propose within the next three months to start up the Iron mine, near Leadville, says the News-Dispatch. This mine has been abandoned for the past twelve years. As soon as the North Moyer shaft has been completed and the surface equipment in operation, Manager Walsh says he will take the present plant to the Iron mine shaft and begin work. It is intended to connect all three shafts and to open up the ground to determine the ore in sight. The Iron Silver Mines Co. has several hundred acres on Iron hill and Manager Walsh thinks it can be made to produce paying ore in lead, copper, silver, iron and zinc values. The Moyer mine is shipping 200 tons of zinc ore per day.

T. Kyle, manager of the Boulder mine, in Big Evans gulch, near Leadville, says machinery will be put in, including a 100 H. P. boiler and a pump.—The Collins group, H. B. Collins manager, expects to resume work this week. The Reno will be operated first, and the Big Evans gulch group later.

The tonnage from the mines around Leadville for March aggregated 74,000 tons of all classes of ore. The output of zinc was 7000 tons—exceeding that of February. The total value was \$1,000,000. It is expected that the present month will show an increase and that the output will reach 3000 tons per day.

At the Sixth-street shaft, at Leadville, on the 600-foot level to the west, manganese-iron ore has been struck, some of it showing values in silver. Osgood & Sullivan are lessees.

LA PLATA COUNTY.

The Mary Helen M. Co. has organized to operate on Oro Fino hill, near the Neglected group, near La Plata. The main working is a tunnel of 500 feet, and a contract has been let for 100 feet more. W. C. Chapman is president, E. H. Van Endert manager.—A company has been organized by C. S. Thomas, C. J. Hughes et al. of Denver to operate on a group near the Neglected mine.—The Bonnie Girl Co., organized last fall, is patenting a group in Tiburco gulch, on the La Plata river, near La Plata, and will build a combination mill this year.

MONTEZUMA COUNTY.

The La Plata Miner says around Mancos by June 1 more men will be employed, more mines worked and a greater amount of ore shipped than at any time since the camp was discovered.

OURAY COUNTY.

G. E. Pierson, having a lease and bond on the Gold Queen group of twenty-three claims and a mill site, on the divide between Poughkeepsie and California gulches, near Ouray, says a mill for concentration will be erected during the present year, in addition to the completion of two crosscuts now in some distance.

The Iron City mine, 2 miles from Ironton, owned and operated by the Continental-American G. M. & M. Co., will begin operations next week.

PARK COUNTY.

The Olive well in the South Park field, 5 miles north of Hartsel, has been sunk to 1250 feet, by Chicago parties, incorporated as the Illinois-Colorado Oil, Coal & Gas Co. They have already struck two seepages of oil and a flow of gas.

SAGUACHE COUNTY.

A strike was started last week in the Independent mine, at Crestone, when forty miners, engineers and pumpmen quit work because of the importation of two engineers from Leadville to work a twelve-hour shift in place of three eight-hour shifts, as were formerly run. Manager McGeorge will keep the pumps going if possible. The Leadville Miners' Union, of which the two new engineers are members, has been asked to prevent the coming of any more of their men to take the place of the strikers. Manager McGeorge and Superintendent McNeeley are Leadville men. There is no union in the Crestone district, though union wages have been paid and most of the men belong to Creede and other unions. The only cause for the strike is the determination of the management to work the engineers twelve hours instead of eight hours, as formerly.

SAN JUAN COUNTY.

The Bessie McKisson G. M. Co., operating the Bessie mine, in Minnie gulch, near Silverton, has been reorganized as the Lake Shore Con. G. M. Co., with E. J.

Cable, F. H. Evans and L. V. McKesson officers and W. A. Ptolemy superintendent. The present work is confined to running two tunnels on either side of the gulch on the Bessie vein.

Mining operations in the vicinity of Animas Forks is being revived by the announcement that the Silverton Northern Railroad will be extended into that section during the coming summer. Not only will the road tap the Burrows Park country, but will open up the way for some of the mines of Poughkeepsie, Mastodon and other gulches to ship at a profit.

SAN MIGUEL COUNTY.

Work of reconstructing and putting in new machinery in the Alta mill, in Turkey Creek basin, is progressing, says Manager Mansfield, and operations will resume next week. The plant will comprise twenty stamps, a Huntington mill, vanners and concentrators, and have a capacity of 100 tons daily. When the mill starts the number of men at work in the mine will be increased to seventy-five. The vein carries 3 feet of heavy ore running in gold, silver and lead values.

At the Butterfly mine at Ophir the tram has been equipped with a new cable and the mill repaired. At present only ten stamps are dropping, owing to scant water supply, but this will be increased with the melting snows. The drift being driven from the lower crosscut which tapped the vein last fall has reached a depth of 500 feet, in ore the entire distance, while an upraise being driven is in the same character of ore. Assays show an average of \$23 in gold. Other than the ore taken out in the driving of this drift and upraise, which supplies ten stamps, no ore is being extracted, as the upraise must be connected with the upper levels for ventilation before many men can be worked to advantage.

SUMMIT COUNTY.

Manager G. Tyler of Hastings, Neb., says he will put in an air compressor and machine drills in the Nebraska tunnel, on Baldy mountain, near Breckenridge. The vein was cut by a shaft farther up the hill and a tunnel started lower down. This vein carries gold, silver and iron and is a low-grade proposition.

TELLER COUNTY.

Manager Wattles of the Bull Hill M. & Dev. Co. has finished building the ore bins on the Cresson mine at Cripple Creek and shipments are resumed.

The Mint Con. M. Co. at Cripple Creek report shipping five carloads of \$40 ore last week. Most of the ore is being broken in third level at depth of 460 feet; vein 3 feet in width. J. H. Williams has a lease on the Boston and Cripple Creek group on the east slope of Tenderfoot hill.

The property of the Copper Mountain Co. on Copper mountain, near Cripple Creek, has been leased to W. Swanson and H. P. Reiton of Cripple Creek, who intend to begin development to locate the contact, where it is believed the main ore shoot of the hill will be found. Machinery will be put in. The shaft on the Lost Lillie claim will be used.

The Independence Con. shaft at Cripple Creek is down 1240 feet, going to the 1250-foot point, being sunk by the Cripple Creek M. Co., lessee. They have run levels at every 100 feet and the level at the 1150 foot point has been extended west to the vein and work is being done in a crosscut to the south to reach the Glorietta shaft. The lessee has shipped a large tonnage. It is understood that the company expects to start work again next month on company account and do additional development.

The Chicolo Con. Co., owning ground on Tenderfoot hill, Cripple Creek, will begin operations next week on company account. The work will be confined at first to development. The deepest shaft is 175 feet. The claims lie on the west slope of Tenderfoot hill and are contiguous to the Hoosier.

The reduction plant of the Gold & Globe Co., in Goldfield, began operations this week. It has a capacity of 100 tons of ore per day. The company has installed an entirely new plant of machinery on the Ironclad mine. They are hoisting fifty tons of ore per day and will increase this amount to 100 tons.

A 4-drill air compressor has been put up on the Cripple Creek Enterprise at Cripple Creek, and machines are at work in the mine. The crosscut in 200 feet north of the shaft from the 210 foot level, which is the bottom of the shaft, will be extended.

IDAHO.

BOISE COUNTY.

The War Eagle Co. began piling their East Hill placer ground near Idaho City last week.

W. A. Stevens of the Mines Exploration & D. Co., operating near Idaho City, says work will be resumed on the Dora group of claims. A tunnel has been driven on the ledge for 125 feet, showing the vein 4

feet wide with assays of \$30. The ore is free milling.

CUSTER COUNTY.

The Idaho Central G. M. & M. Co. has incorporated under South Dakota laws to operate the Fred Pratt and the Ready Bullion claims, adjoining the Lost Packer mine, near Mackay.

IDAHO COUNTY.

Manager C. F. Macey of the Iron Springs M. Co. of Youngtown, O., operating in Rapid Creek district, near Warren, says development work will be increased and machinery put in this season. Work at the mines has been in progress all winter, and as soon as the hoist is placed in position sinking will resume. It is intended to build a concentrator.

Kansas City, Mo., men have organized the Brant G. M. & M. Co., to take over and develop several groups of claims in Thunder Mountain district, near Roosevelt, including the Yankee Boy and Pearl properties, on Little Marble creek, near where it empties into Big creek.

The Elk City G. M. & M. Co., owning the Lily May group, on Red river, near Elk City, will drive the tunnel 100 feet farther. J. Coverly, part owner, says the claims are 2 miles west of the American Eagle group, and development has shown a 6 foot ledge carrying gold values. A surface cut exposes a ledge of free-milling ore assaying \$15. The tunnel should tap the ledge 50 feet farther at a depth of 200 feet.

F. Brown, manager of the Jumbo mine in Buffalo Hump district, near Hump, says he expects the new mill to be ready for work by the first of July. They will have fourteen stamps to start with, although the building is being erected for thirty stamps. The Crackerjack Co., in the same district, has a surveyor on the ground preparing plans for an electric power plant, the power to be generated on Lake creek.

SHOSHONE COUNTY.

Wallace reports that the option of the smelter combine to acquire certain Cœur d'Alene mines has been extended. The deal will include the principal producing mines of the Cœur d'Alenes except those owned by the Empire-State, Bunker Hill and Hercules companies.

The Moscow Citizen says the Evolution mine at Osburn, the first location in the Cœur d'Alene district, is again producing ore with values in copper and gold.

B. C. Hammitt and H. Oxley are hydraulicking at the foot of the Montana bar at Thiard.

The Cœur d'Alene M. Co., operating the placer diggings west of Murray, are preparing to resume. They have forty men at work, and the sawmill which was erected during the winter is being operated to its full capacity, turning out lumber for flumes to be built this summer. The company will put in machinery at its placer grounds.

MICHIGAN.

HOUGHTON COUNTY.

The Champion has present difficulty supplying sufficient rock for all three heads of stamps through the inability of the present plant to give enough compressed air. Pending the installation of the 100 drill compressor now building, the present compressor can furnish air in three shafts only at fifty to sixty pounds pressure instead of eighty. Small compressors have been set up temporarily.

The Mohawk product for March was 397 tons of refined copper—a yield of twenty-seven pounds per ton of rock stamped. The shipments to the Mohawk mill, near Houghton, aggregated 900 tons daily, being largely from Nos. 1 and 2 shafts; small shipments are made from No. 3 and also from the stock pile—estimated to contain 70,000 tons—the removal of which began recently.

MONTANA.

BROADWATER COUNTY.

At Winston the East Pacific M. Co. has been incorporated to erect an electric power plant and mill near Winston, says the Inter-Mountain. The mill will have a capacity of seventy-five tons of ore a day.

CASCADE COUNTY.

The Great Falls M. Syndicate, which recently bought the Tyler group of claims, 2 miles from Montana City, has handed the property to Jones & Martin of Great Falls for \$10,000. Development work has begun.

DEER LODGE COUNTY.

W. R. Allen has incorporated his mines at French gulch into the Allen G. M. Co. The group is 20 miles south of Anaconda. W. R. Allen, F. R. Gordon, W. H. Mahony, T. C. Davidson, P. J. Foley, W. W. McDowell are directors. The company proposes to erect a concentrator and mill this summer. Aside from that, it is incorporated to build telephone and telegraph lines.

FERGUS COUNTY.

Sapphires from the Burke & Sweeney mines at Yogo are to be cut at the mines by lapidaries. In the past sapphires from Montana have been sent in the rough to New York, Paris and London and were cut there.

FLATHEAD COUNTY.

The Montana & Spokane M. Co. has organized at Spokane, Wash. F. M. Fortune, E. Denzel and J. F. Collins of Spokane and G. Robinson of Libby are directors. They have a group of claims on Fourth of July gulch, West Fisher district, near Libby, including twelve lode claims, four placer claims, a water right and a mill site.

GALLATIN COUNTY.

The Montana Corundum Co. has closed down its mines and mills near Bozeman for the time being, owing to a disagreement among the stockholders, although they were being operated at a profit, says the Inter-Mountain.

Coal is reported from Storrs', near Bozeman, by the Washoe Co. Although the company has known there was coal underlying the hill, so far the main bed has not been found. The main tunnel has been run east in 850 feet and two side tunnels started to the north. Two small veins were cut along the line of the main tunnel. Last week the first north tunnel struck a body of coal which runs parallel with the transfer tunnel and has been crosscut for 12 feet. The washer is finished and foundations laid for the coke ovens. Work has begun on the electric plant.

GRANITE COUNTY.

The Moose Lake M. Co. has incorporated at Anaconda; T. J. Cadle, W. A. Bower, R. E. Taylor, F. W. Peckover. The company owns the Dandy and Daisy quartz claims and the Last Chance placer claim and mill, near Moose lake, near Phillipsburg. The company also owns the Abe Lincoln mine.

The Billy Maddox M. Co. has been incorporated at Missoula (Missoula county) by D. Arms, E. A. Winstanley and D. T. Conkling, to work the Billy Maddox gold mine at Royal.

LEWIS AND CLARKE COUNTY.

The East Side M. Co. of Helena has decided to build a concentrator. W. W. McDowell of Butte is vice-president.

Work has resumed on the Farmer group, in Scratch Gravel district, near Helena, and a mill will be put up.

MADISON COUNTY.

W. M. Brown, directing engineer for the Bismarck & Nugget G. M. Co., operating near Sheridan, reports the plans of the company will involve spending \$100,000 this summer in building a plant for treating the ores and developing the mines at Brandon. The gallows-frame for the hoist is up.

PARK COUNTY.

Manager G. T. Wickes of the Livingston Coal & Coke Co. says their mines near Livingston will be reopened and the coking plant started up again. Pumping machinery will be put in.

SILVER BOW COUNTY.

Fire at Farrell shaft No. 2 of the Pittsburg & Montana M. Co. at Butte destroyed the boiler house and engine house and damaged the gallows frame on the 18th inst., says the Inter-Mountain.

There are being worked in Butte four mines below the 2000-foot level and the veins are as strong and as rich as the formation encountered at 1000 feet. The deepest shafts are the High Ore, Diamond, Green Mountain and Consolidated. Shafts on several other properties which have reached close to the 2000 mark are the Never Sweat, 2000 feet; St. Lawrence, 1885; Anaconda, 1800; Bell, 1800; Buffalo, 1600; Parrot, 1600; East Cora, 1500, and others.

The Inter-Mountain says work will be resumed on Farrell shaft No. 3, on the flat east of the Boston & Butte smelter at Butte. Heavy hoisting machinery is being unloaded there.

F. A. Heinze of the United C. Co. is reported as saying the company produced 30,000,000 pounds of copper in 1902, notwithstanding the burning of the works, and at the present selling price of copper is earning at the rate of \$1,800,000 per annum.

NEVADA.

ELKO COUNTY.

The management of the Dexter company's mines and mill at Tuscarora has determined to recover the values in the slimes ponds that surround its plants, and to that end will this season erect a slimes cyanide plant, says Managing Director Lee, at Salt Lake City, Utah.

ESMERALDA COUNTY.

The Pine Grove G. M. Co. has been organized to unwater and develop the Wil-

son mines at Pine Grove; H. C. Cutting is president, A. L. Hudgens secretary and treasurer. A tunnel to be run 5000 feet to drain the ground and tap the Wilson ledge has been started, and also cut a series of intervening ledges. An air compressor and drills will be put in. J. W. Luke is manager.

LANDER COUNTY.

J. Kempton reports finding placer gold in the gulch west of the Avalanche mine, near Galena, and that he is making from \$2 to \$6 per day.

LINCOLN COUNTY.

The De Lamar Bonanza G. M. Co. has been incorporated at Salt Lake City, Utah, to develop sixteen gold-bearing locations adjoining Bamberger's De Lamar mines on the south. A crosscut has been driven 600 feet with the first ledge to be cut 200 feet ahead. L. E. Bamberger, W. W. Armstrong, J. Oberndorfer, G. C. Fetterman, H. G. Millan are directors, with G. C. Fetterman as manager.

H. A. Perkins, manager of the New Era M. Co., near Searchlight, says they will erect a 10-stamp mill this spring. This will make five 10-stamp mills in that district.

Albright, Weaver & Spencer are working several locations near Lewis' holes, 12 miles from Searchlight. They have a 4-foot vein showing free-gold values. There is also a showing of mica from which several hundred pounds of mica have been shipped. Further development work will be done to ascertain the extent and value of this find.

NYE COUNTY.

The Tonopah Home M. Co. has been organized to work 43 57 acres adjoining the ground of the Montana-Tonopah, Silver Top, Belle of Tonopah and Black Diamond companies at Tonopah. W. J. Douglass, S. A. Knapp, G. Winkler, G. W. Richard, C. M. Hooten are directors.

STOREY COUNTY.

Manager J. Ryan says he has arranged to resume on the 1600 level of the Ophir at Virginia City, working through the Sierra Nevada, Mexican and Union shafts.

Manager J. Ryan says extensive improvements are proposed in the Gold Hill mines, near Virginia City, and all of the lower workings will be supplied with electric power. The electric cable in the Caledonia shaft, which carries 2300 volts, is to be tapped at the 900 foot level and extension cables carried through the Seg. Belcher, Belcher, Confidence, Crown Point and Yellow Jacket, the power being transformed to a lower pressure for lights and driving motors for blowers, hoists, winzes, etc. Work will begin next week. When this installation is completed the use of compressed air will be dispensed with.

An electric hoist is being set up at the Andes and Utah mines, near Virginia City.

WHITE PINE COUNTY.

The White Pine C. Co. has been organized by M. L. Requa of San Francisco, Cal., to operate the Ruth group of fifteen claims near Ely. The ore is said to average \$4 per ton in gold and 3% copper.

NEW MEXICO.

GRANT COUNTY.

(Special Correspondence)—The American Con. Copper Co. will put in a leaching plant near Lordsburg. They last week shipped three carloads of ore to El Paso. W. J. Sapp is superintendent of mill and A. R. Randall is superintendent of mines.

The Comstock group in Virginia mining district, near Lordsburg, will put in power drills. A carload of ore was shipped last week to Douglas smelter. Ore runs two ounces in gold, some copper and silver. They have large bodies of low-grade ore which they are testing as to the best methods for handling. The shaft is down 230 feet. C. Yeager is superintendent. Lordsburg, April 20.

The Wild Cat group of mines at Santa Rita, 16 miles northwest of Silver City, has been bonded and leased to St. Louis, Mo., men. The method of treating ore will be changed and rollers and crushers will be substituted for the Huntington in the concentrator. H. C. Begolo of St. Louis, Mo., is interested.

The mill of the Hanover M. & M. Co. at Hanover has started up and a sampler is also in operation. They have a capacity of 150 tons of ore per day and handle gold, silver, copper and lead ores. The sampler enables the lessees and miners who are developing in that section, to bring their ores in large or small quantities to the sampler to sell them and receive cash in payment. In the Fierro district the Colorado Fuel and Iron Co. is producing 500 tons of iron ore per day, which is shipped to the Pueblo smelters by the Santa Fe railway.

OKLAHOMA.

OKLAHOMA COUNTY.

Shipments are being made by the Indianapolis Oil Co., near Oklahoma City, to the Neodesha refinery.

OREGON.

The Oregon Placer & Power Co. of Sumpter, operating between Sumpter and Granite, have begun operations for the season. The company have 200 acres of land and an 8-mile ditch from the south side of Old Baldy. The placers are in the former river bed and were opened up three years ago. Machinery has been put in and they have a bedrock flume 3 miles long.

Manager Smith of the Snow Creek mine, near Sumpter, reports ore struck in the crosscut on the west 70-foot level, being an oxidized ore. The company is planning for a 10-stamp mill and concentrator. Ore is being blocked out.

T. J. Costello, president of the Forest M. Co., operating the Storm King group in the Cable Cove district, near Sumpter, says more men have been put to work. They are sinking on the Eureka claim. At 1400 feet from the shaft on the southeast end drifting on the ledge will be started. The Storm King group includes seven full claims.

The Minersville G. M. Co., near Sumpter, will put in a hoist and pumping outfit, including two 80 H. P. boilers and a 300-gallon pump.

Manager E. W. Mueller of the Standard Con. M. Co., the consolidation of the former Standard, Willie Boy and Copper Ridge companies, says operations have begun on their properties near Sumpter this week. The first work will be to extend the Willie Boy crosscut, which is near the Willie Boy vein. This tunnel is 431 feet long, and when it reaches the Willie Boy vein will give a depth of 300 feet.

Manager L. Q. Jaquish of the American Development Co., owning placer ground near Auburn, says spring operations will begin next week. The surplus water of Elk creek has been leased and added to their other supplies, and the lower end of the Auburn flume repaired.

The Orleans management propose to place a hoist at the mine, which is near the Golconda.

F. D. Smith, manager of the Snow Creek mine, in the Greenhorn district, near Sumpter, says 164 feet of crosscut were driven last month. They are blocking out ore, getting ready for the 10-stamp mill which will be built this summer. From five sets drifted on the ledge averages of \$20 were obtained.

GRANT COUNTY.

May 1 the Hoosier Boy M. Co. will begin work at the Prairie Diggings mine, near Prairie City, says Manager F. W. Messner. The mill has twenty-five stamps, power being furnished by three water wheels, one for the batteries, another for the concentrators and light plant, and the third for the crusher.

The shaft at the Red Rock group of claims, near Gold Center, near Granite, will be unwatered and a crosscut will be run from the 200-foot level. The shaft is down 300 feet. D. Yeager is superintendent.

Baily & Gren, owning the Tahoma group, near Granite, are doing development work. They will sink their shaft and drift both ways on the vein. After exploring the shoot opened last winter a tunnel will be driven from a lower level to open the vein deeper than the shaft.

G. F. Berbridge of Spokane, Wash., last week bought the Independence group of claims, near Granite. The Independence is between the Cougar and the Magnolia groups, and comprises three full claims and three lode fractions, which have two veins, one of which is thought to be the Magnolia, and the other one of the Cougar veins. There are three tunnels 40, 65 and 275 feet on the vein and a shaft.

JACKSON COUNTY.

(Special Correspondence)—Ward & Co., the purchasers of the copper mine on the Illinois river, are sending via Jacksonville supplies and men for opening up the mine. Jacksonville, April 20.

It is locally reported the Elliott Creek copper mines in the Siskiyou mountains, near the State line, southwest of Ashland, have been sold to P. Clarke of Spokane, Wash., for \$210,000, of which \$65,000 has been paid down. Development work will begin next week. A daily stage line has been put on between Jacksonville and the mines.

The Joe Creek copper mines, 25 miles from Jacksonville, have been sold to P. Clark of Butte, Mont., for \$210,000.

JOSEPHINE COUNTY.

Superintendent J. T. Logan of the Simons-Cameron placer mine, near Waldo, says they have had a profitable run this season. The hydraulic elevator has per-

mitted of handling a large amount of gravel at less cost than in previous seasons.

At the Kremer-Palmer mine of Mt. Reuben, near Grant's Pass, a 4 stamp mill has been put in. The ledge being opened up shows 5 feet wide, carrying values in free gold.

S. Bowden of Spokane, Wash., has taken over the Free and Easy quartz mine, near Grant's Pass.

SOUTH DAKOTA.

CUSTER COUNTY.

The London & Dakota M. & S. Co. has been incorporated to work a group of claims in Penobscot district near Custer, and they own a water right on French creek. The claims are half a mile east of the Saginaw mine. J. Whitley of London, Eng., is president; T. W. Delicate, E. L. Grant-ham, C. P. T. Colmey, W. E. Mason, L. Rolland, A. C. Hastings, F. W. Lawson, W. W. Wright, M. A. Willis, A. Gibbs and C. Robinson are directors. Development has begun.

LAWRENCE COUNTY.

F. M. Wall has a lease on a group of claims, owned by L. Boswell, on Doad Dog hill, between Central City and Portland, near the head of Deadwood creek. Since beginning work he has opened up ore assaying \$40 a ton. The ground is in the phonolite belt and the ore contains values in white iron. He is driving a tunnel to cut the ledge with depth.

The Wasp M. Co. treated 3400 tons of ore at the cyanide plant on Yellow creek, near Lead, during March, recovering \$8000 in gold bullion. A new approach has been built to the mill. An incline has been cut through the quartzite from the mill to the mine, reducing the haul by one-half (700 feet) and making an all inside haul, so that weather will not interfere. The present haul is down a grade of 2%, with the exception of the last 200 feet at the mill, which is on a level, so as to slow the cars up for dumping. The ore bin at the top of the mill has been enlarged.

The University G. M. & M. Co., near Deadwood, has driven 1000 feet of tunnels and drifts on the South Dakota mine on Annie creek since taking possession last fall, and has opened up paying ore on four horizons, one of which is showing a breast of ore 15 feet thick assaying \$6. A tunnel has been started from the surface, and driven to within 75 feet of the bottom of the winze, passing through several ore bodies. The company will erect a mill of 100 tons daily capacity on Annie creek this year, to be used jointly with the Ak-Sar-Ben G. M. Co., the owner of adjoining ground.

TEXAS.

JEFFERSON COUNTY.

A careless workman kicked over a lantern at one of the Caldwell oil wells on the Hogg-Swayne tract on Spindle Top, near Beaumont, on the 15th inst., causing a fire that resulted in a property loss of \$1,000,000. There were 175 wells on the three blocks of the tract and only five of the derricks and pumps are left standing. Every company that had property in the Hogg-Swayne tract is a loser. The derricks left are on the edges of the tract. None of the companies had any insurance. No settling or storage tanks were burned, as there were none up on the Hogg-Swayne tract. The fire started near the southern edge of block 38 and spread three ways. Fifty wells probably are ruined by the dropping of tubing into them as a result of the fire. Among the losers are: London Oil & Pipe Line Co.; Caldwell Oil Co.; Spindle Top Power Co.; Central Power & Equipment Co.; Pumping Stations Dividend Oil Co.; Detroit-Beaumont; Palestine-Beaumont; Sun Co.; Advance Oil Co.; Queen City; Queen of Waco; Drummers; Alamo; Bukeye; Ground Floor; Manhattan; Borealis; Buffalo. Several pipe lines were damaged.

UTAH.

BEAVER COUNTY.

Twenty feet per day are being made in the Caotus working tunnel at Frisco, and it will require nearly a year to complete the remaining 5000 feet, says Manager M. M. Johnson. Work is being done at both ends. The working shaft has been equipped with an 80 H. P. steam hoist and air compressor. All of the tunnel work is to be done by contract. Work on the concentrating plant will begin next month. It is also the intention to resume blocking out the ore bodies down to the 600 level.

IRON COUNTY.

The Iron Mountain C. Co. have given an option on their Homestake group of fifteen claims at the foot of Iron mountain, near Cedar City, Utah, to A. B. Lewis of Salt Lake City, Utah, president of the Majestic Co.

The Colorado F. & I. Co. have bought

for \$200,000 the Taylor Estate iron mines near Cedar City, and O. M. Ladd, of Salt Lake City, the Utah representative of the company, has sixty men at work there. The Tarantula claim of Thompson & True Co. has also been sold to the Colorado Co. for \$10,000.

JUAB COUNTY.

Managing Director A. F. Holden of the United States M. Co., operating the Centennial-Eureka mine at Eureka, in his annual report to the directors at Portland, Me., last week, says the main shaft was retimbered and exploration work carried on, stopping being resumed Sept. 1, 1902. They are shipping to their smelter 250 tons a day. Arrangements have been made to sink the main shaft 500 feet deeper. When this property was bought there were two known ore channels in the mine. Development has shown three additional profitable ore channels.

Superintendent C. Parker of the Mineral Point mine, near Juab, says a 3-stamp crusher will be put in and he will concentrate the product already broken, consisting of 300 tons of 20% lead ore. The mine is opened by a tunnel. The formation is sandstone.

Salt Lake reports say H. N. Sweet & Co. of Boston, Mass., have bought a controlling interest in the Eagle & Blue Bell M. Co. properties, near Eureka, near the Grand Central and Centennial-Eureka mines.

SALT LAKE COUNTY.

At the annual meeting of the United States M. Co., operating at Bingham, held in Portland, Me., last week, Managing Director A. F. Holden's report showed, since March 1, 1900, 23,539 feet of exploration work has been done, principally in the Old Telegraph and Jordan mines, developing 1,000,000 tons of workable ore and has shown the continuity of the veins at depth. The Commercial vein has been developed. The power plant is ample for a production of 1000 tons per day. Last year the mines were connected with the Rio Grande Western railway by a wire rope tramway, 3 miles in length. Little work has been done in the Niagara mine. Certain upper levels were let out to leasers. The smelter was started up last December, and has been running with the usual vicissitude of a new plant. No metallurgical difficulties have been encountered, for the mixture of the ores of the Centennial-Eureka and United States mines has proven a profitable one, the slag losses being low. The bin capacity has been doubled; the automatic part of the dust chambers is to be extended, the briquetting plant improved, and other minor changes made. The company also owns the Centennial-Eureka mine at Eureka (Juab county).

The Davis & Gebhart group, at Bingham, is under option to W. C. Ochs of Salt Lake City for \$250,000. The group consists of 156 acres, extending from the properties of the Bingham and New Haven and Highland Boy companies on the west and north to those of the United States M. Co. on the east and south.

SUMMIT COUNTY.

F. W. Sherman, superintendent of the Daly-West mill at Park City, is making a number of improvements at the Daly-Judge mill, chief among them being the addition of a set of slime-settling tanks, also a 5 foot Huntington mill, another three-compartment jig, three more concentrating tables. It is expected with these to increase the capacity to 350 tons per day.

The work of sinking the shaft of the Lower Mammoth from the 1100-foot level to the 1200-foot is in progress. The station at the 1100-foot level is completed and the donkey hoist that was used on the 900-foot level has been set up there. From this point they will drift both south and west.

TOOELE COUNTY.

The Michigan M. Co. has been incorporated at Salt Lake City to operate near Ophir; R. L. Hammond, H. G. Twomey, J. B. Welmer.

The Four Metals M. Co., operating in the Deep Creek district, near Ibapah, will build a mill, says Manager G. L. Moats. Experiments are being made to determine the best process to adopt.

UTAH COUNTY.

The Mount Nebo M. Co. of Salt Lake City has incorporated, with A. W. Browne, H. Straw, H. M. Short as officers. The company will operate near Mount Nebo.

WASHINGTON COUNTY.

The first lot of copper bullion from the smelter at the Dixie mines, near St. George, being two carloads, was shipped last week, says Manager J. E. Beveridge at Salt Lake City. More men will be put to work in the mine.

The Paymaster group is under option to H. F. Fairchild of New York for \$90,000, and first payment was made. Machinery will be put in and the shaft

sunk from 170 feet. J. E. Beveridge of Salt Lake City is consulting engineer.

WASHINGTON.

SNOHOMISH COUNTY.

Manager Hickey of the Copper Independent M. Co., near Silverton, says machinery for the Independent concentrator is on the ground.

WYOMING.

CARBON COUNTY.

The Overland Oil & Gas Co. struck a flow of oil at Fort Steele last week at a depth of 2000 feet. They expect to find greater quantities at 3300 feet, which depth will be reached by May 5, as they are drilling from 50 to 75 feet a day.

Superintendent W. Bunce of the North American C. Co. at Rudefeba furnishes the following scale of wages for those employed at the Ferris-Haggerty mine, which corresponds with the standard scale prevalent in Colorado camps, viz: Machine men, 8 hours, \$4 a day; machine helpers, 8 hours, \$3 50; timbermen, 8 hours, \$3 50; miners (band steel), 8 hours, \$3; trammers, 8 hours, \$3; muckers, 8 hours, \$3; blacksmiths, 9 hours, \$4; tool dressers, 9 hours, \$3 50; carpenters (underground), 8 hours, \$4; carpenters (surface), 9 hours, \$4 laborers (surface), 10 hours, \$3; engineers (compressor), 12 hours, \$4. The company reserves the privilege of making special rates and arrangements in special cases.

FREMONT COUNTY.

Oil well No. 11 on the Henderson property, Popo Agie fields, 10 miles southeast of Lander, was completed last week, the drill striking the oil sands at a depth of 325 feet. Well No. 12 is down 500 feet, says Manager Henderson.

UINTA COUNTY.

A 3-foot vein of coking coal is reported struck last week 12 miles north of Cokeville. The only other coking coal deposits in Wyoming are in Weston and Sheridan counties.

It is reported at Evanston that the Union Pacific has filed articles of incorporation of an auxiliary company and will build a railroad from Hampton, on the main line, northwest to the Cumberland coal mines, thence back to the main line at Altamont. The line will be 50 miles long and pass through the oil fields, as the transportation problem has been a serious one in their development. Several companies had arranged to build pipe lines, but this will not now be necessary.

VIRGINIA.

PAGE COUNTY.

Manager T. A. Dunshee of the Virginia Con. Copper Co., operating on Hoak mountain, 4 miles southeast of Luray, says on the 120-foot level in a 230-foot drift they have a body of copper ore 40 feet wide, assays averaging 5%. They have some native copper. There are three veins of ore in the mine, dipping at such angles that they are expected to unite at a depth of 250 feet. The copper occurs mostly in the quartzite. The main shaft is down 162 feet. It is understood the company propose to erect a mill and smelter later on, says the Page Courier.

FOREIGN.

AUSTRALIA.

QUEENSLAND.

The Launceston Tin M. Co. at Herberton, during the year 1902 treated a total of 1580 tons of Launceston ore for a yield of 224 tons No. 1 concentrates and 11 tons No. 2 concentrates. The lode between Nos. 1 and 2 shafts averages 3 feet in width, carrying 12% tin ore.

SOUTH AUSTRALIA.

At Tarcoola, at the Blocks mine, the cyanide plant is completed. Rock drills and an electric plant have been installed.

In Northern Territory, at Winnecke's depot, on the Reward claim, a reef has been exposed showing a width of 6 feet of milling ore, with free gold.

BRITISH COLUMBIA.

J. W. Ross of Ymir has formed a company at Buffalo, N. Y., to take over the Empress of India group of claims, on the divide of Hall and Barrett creeks, 8 miles from Ymir. The ledge carries values in copper.

There are fifty-two men on the payroll of the New Fairview Corporation at Fairview, Okanagan, at the Stemwinder mine, stamp mill and cyanide works. In the mill forty stamps are dropping. The ore shoot at the 300-foot level is quartz with gold values.—Two shifts of men are at work in the Morning Star, in Fairview camp.

Near Wilmer the Paradise and Ptarmigan mines continue regular operations. The Paradise, owned by Toronto men, is on Spring creek, a tributary to Toby

creek, and managed by R. R. Bruce. Thirty men have been at work underground during the past year opening up the ore bodies. The mine has a vein of shipping carbonate ore which carries 200 ounces of silver and 30% lead. It also has bodies of ore carrying 30 ounces of silver and 20% lead. It is reported the company will construct a tramway to Pine creek, 5 miles from the mine, where a mill will be built during the coming summer. The Ptarmigan is on Red Line creek, a tributary to Horse Thief creek. Superintendent Starboard has thirty men underground. There are two veins, one 12 inches in width, carrying ore that runs 300 ounces of silver, one-half ounce gold and 5% copper. The second is 30 feet in width of iron pyrites carrying 2% copper, 40 ounces silver and \$4 in gold. The company has a 4-drill compressor and a sawmill. A double cable tramway is on the ground and will be put up as soon as the weather permits, to convey the ore from the mine to the compressor and millsite, a distance of 7900 feet. They will also put in an electric power plant on Horse Thief creek and transmit power to the millsite, 7 miles distant, together with a 50-ton concentrating plant. The Ptarmigan is controlled by Tiffany & Co. of New York City, N. Y.

It is reported the Western Federation of Miners at Nanaimo has extended the strike in the Dunsmuir collieries to the mines at Cumberland. This is in consequence of President Dunsmuir's refusal to meet the delegation of Ladysmith men on the 18th inst. The strike of the latter has been going five weeks. Both Comox and Nanaimo harbors are crowded with ships waiting for coal. This will leave Nanaimo the only point actually shipping coal on Vancouver Island. Between 2000 and 3000 men are affected. The stoppage of the Cumberland mines will cut off the coal supply for the Canadian Pacific liners running to China and for the locomotives on the Pacific division of that line. The miners employed by Dunsmuir struck in March because of his refusal to allow them to form a union and amalgamate with the other unions. Dunsmuir has maintained this attitude for years, but the miners thought they could successfully force the issue now because of the increased demand for Vancouver Island coal since the removal of the American duty.

H. P. Jackson, manager of the Contact mine in Burnt Basin, near Rossland, has closed down the property until the snow goes off the trails leading into the basin, as the camp ran short of supplies and more cannot be taken in until the trails are passable. When work was suspended the main vein had been opened up for 135 feet, the ledge carrying ores for its entire length. It was found impossible to proceed farther with this drift or to secure additional depth without sinking, and the facilities for bringing machinery into the Burnt Basin section are nil. They started a crosscut to the southwest to cut another known ore body. This crosscut is in 60 feet. Another 20 feet will bring the workings to the second ledge. The Contact Co. and others interested in the Burnt Basin section are awaiting the action of the Government in regard to a wagon road, and after this is built machinery may be taken in, says the Rossland Miner.

Last week sinking was resumed below the third level in the main three-compartment shaft on the Snowshoe mine, near Phoenix. A station pump was set up at the third level. The electric 150 H. P. hoist is in position at the main shaft and the transformers are being put in. The ore will be hoisted in 2-ton skips. During the several weeks the mine has been unable to ship ore, on account of the coke famine, development work has gone ahead. With glory holes, which can be worked again as the snow is gone, the mine can maintain an output of 600 tons of ore daily.

B. N. White's Slocan Star mine, near Sandon, is shipping 100 tons of crude ore a week to Pueblo, Colo., and is working thirty men.

The Active G. M. Co. of Cincinnati, O., which controls the Union Jack group of mines on Porcupine creek, near Ymir, has acquired 8 square miles of timber land near the claims. The whole area is covered with white pine, fir, hemlock and cedar. A plant will be erected, including a shingle mill of 60,000 daily capacity, which will be built at a point near the junction of the main and south forks. D. Cameron, local manager, states he expects to make enough profit on the lumbering operations to pay for the complete development of the mine. The company has put in electric drills. The power is supplied by an impulse water wheel of 50 H. P., operating a dynamo. Work is concentrated on the lower tunnel on the Queen vein, which is being run to get below the shoot found 100 feet above. This pay shoot was 5 feet wide. It consists of galena running \$7 in gold, 40 ounces in

silver, 30% lead. In the lower tunnel a streak 3 feet wide, consisting of galena and oxides, runs the whole length of the tunnel, which averages \$20.

J. Cronin, manager of the St. Eugene mine, near Fort Steele, says until some action is taken by the Dominion Government in the way of increasing the protective duty on lead the St. Eugene will not be reopened. It had been intended to start up when lead reached £13 on the London market, but the recent fluctuations have shown how unstable those prices are.

The Hall mines smelter at Nelson has resumed and 100 men are at work. Lead and dry ores are at present being handled, the supply coming principally from Sloacan and Boundary.

The Crofton smelter at Osborne bay, Vancouver Island, was blown in last week. With all the furnaces at work the capacity is 700 tons daily.

With a renewal in the coke supply operations are resuming in the Boundary. The Montreal & Boston C. Co., operating the Boundary smelter, blew in two furnaces near Greenwood last week. Manager A. I. Goodell says two more furnaces are under construction.

Construction work on two additional furnaces at the Granby smelter at Grand Forks will begin next week, making six in all, with a total capacity of 2200 tons of ore daily.

The coke ovens of the Crow's Nest Pass Coal Co. at Michel, Morrissey and Fernie are in full operation, and coke shipments have resumed.

The Thompson Placer M. Co. of Fort Steele men have started piping on their placer ground on White Horse creek, near Fort Steele. For the past month they have been putting in flumes and repairing the water ditch. The Chinese companies operating on Wild Horse creek have resumed. The Nip and Tuck Co. have put in a hedrock flume and operations are resumed.

The foreign coal shipments of the Western Fuel Co. from Nanaimo for March aggregated 17,372 tons.

The Idaho-Alamo Con. Mines, Ltd., was registered in Edinburgh, Scotland, last month for the purpose of acquiring certain properties from the Scottish Colonial Goldfields, Ltd. The Idaho and Alamo mines are near Sloacan City.

The Queen Bess, near Sloacan, closed down last week.

Last month the total output from the Bosun mine, near Lardeau, amounted to 40 tons of galena and 120 tons of zinc.

As to the recent strike in the Le Roi mine at Rosland, Manager Parish cabled to the London office: "Ore has been found in 1050-foot level west of shaft, probably Mulligan shoot; gold assays average \$16, copper 1%, small amount silver. The monthly report for February shows ore shipped 15,824 dry tons, containing 4906 ounces of gold, 12,314 ounces of silver, 525,970 pounds of copper; average value per ton, \$11.06; cost of breaking and delivering ore on railroad cars, \$2.64 per ton, while cost of development was equal to 54 cents per ton. The diamond drill has not shown the presence of any ore bodies of value. Expenditure for month on mine account was \$57,017. Northport smelter expenditure for month was \$100,037. The smelting costs for the twelve days during which the furnaces were in operation were equal to \$3.88 per ton. The February smelting costs, if reckoned on the basis of the entire expenses for the month, would amount to \$5 per ton."

Fort Steele reports say interest is being shown there concerning the probable action of the Provincial Government in relation to the question of the Flathead valley reserve on coal and oil lands. The Government has shown that it does not intend giving it to the Columbia & Western Railway Co. (i. e. the C. P. R.) by introducing a bill to confirm the order in council which cancelled the crown grant of this reserve to the company. The consensus of opinion is that it should throw the reserve open to the public after granting those applications which have already been made.

JAPAN.

Mail advices say on April 2d sixty-five lives were lost as a result of a fire at the Otu colliery, at Kinshu.

KLONDIKE.

Seattle advices say the placer and hydraulic mining interests in the Klondike are involved in a clash over the proposed Klondike water system. Placer miners claim the scheme came from men in Dawson and is intended to benefit hydraulic concessionaires, who think they will have to allow their grants to revert to the Government unless they can get water from the Klondike. The objections of the miners to the water system are that creek and claim owners would be unable to flume it by their claims without considerable expense, and bench men

would be retarded from using it because they have no dumping ground rights—i. e., they claim the introduction of such a system would mean the sudden change of the country from a placer camp to a hydraulic one. The Klondike district proper is considered good for several years yet for individual miners, provided they are not forced to hand their claims over to the companies for concessions. Placer and hydraulic mining cannot go on on the same creek at the same time, it is alleged.

MANCHURIA.

Prospectors who have gone to Vladivostok for outfits report that gold has been found at several points. The Amursky Gazette says as high as five pounds of gold have been taken from two tons of gravel.

MEXICO.

During the year 1902 the number of titles to mines of all classes of metals issued by the Government in accordance with the provisions of the general mining law of June 25, 1902, was 2247, covering 30,320 hectares of ground (74,920 acres).

CHIHUAHUA.

At Parral the Terranantes Con. Co. has ordered a complete electrical equipment for hoists, pumps and all machinery, to be supplied from a central station, says F. B. Rae, consulting engineer. Work has begun on the Caballo Prieto mine, near Parral, bonded to J. P. Hutchinson.

Manager D. J. Creel states that the copper smelter at Terrazas will be blown in by May 15.

W. P. Dunham of the Consuelo M., M. & P. Co. and F. Ashton are making arrangements to begin work on the company's property adjoining the Dolores mine, near Chihuahua.

C. A. Molson of Salt Lake City, Utah, representative of the Western Exploration Co., says an addition of 100 stamps is to be made to the mill at El Oro, making a total of 200.

Bullion valued at \$250,000 in Mexican money was the production for the month of March of the mines at Acampo. There were 102 bars of silver and gold, of which the Waterson mine had twenty-one, worth \$60,000 Mexican.

COAHUILA.

It is reported at Parras de la Fuente a vein of copper ore, 9 feet in width, has been struck in La Fraternal claim. Assays run 15% copper. The vein is in the Cerro del Oratorio, in the municipality of Parras, and is near the boundaries of Coahuila and Zacatecas. The road which leads from La Boca mine to the smelter at Viesca is a level one, and the cost of transportation over it would not exceed \$10 per ton.

Reports from the Mazopi C. Co. at Saltillo say that extensive improvements will be begun this month.

DURANGO.

The Penoles M. Co., near Mapimi, has three furnaces running steadily.

SINALOA.

A new mining district is reported being opened up 45 miles east of Bamoa. It is stated that several veins have been located carrying gold, silver and copper.

SONORA.

(Special Correspondence).—The Arizona-Mexican C. Co. of Phoenix, Ariz., owning the La Gran Proveedora de Cobre, in Altar district, have run a drift on their property 218 feet and have 110 feet of shaft. They have ore that runs 7% copper, with gold and silver values. A gasoline hoist and power drills will be put in. The group is 6 miles from Caborca and 35 miles from the Gulf of California at Port Lohos. W. E. Defty is general manager and J. Henderson superintendent.

Caborca, April 20.

The 30-stamp mill of the Crestone-Colo-rado Co. at La Colorado is handling 200 tons of ore per day. It is using eight Huntington mills in connection with the stamps. It does the coarse crushing in the batteries, finishing in the Hunting-tons. Vanners are used for concentration.

The La Sonora G. & S. M. Co. is operating its Mina Blanca mine at Suaqui Grande. This work consists of 1200 feet of tunnels and shafts. The vein is 16 feet wide—concentrating and smelting ore—with values in silver, copper, gold and lead. F. E. Dickinson is general manager and T. F. Collins superintendent. A concentrating plant will be erected and later a smelter, says Manager Dickinson.

A 125-ton smelter and refinery is being built at Toledo, 90 miles east of Torres, by the Yaqui S. & R. Co. The equipment consists of a 100x36-inch and one 36-inch circular blast furnace, and softening and calcining furnaces, etc. The plant is expected to be in operation by September. The company's mines produce lead, silver and gold ores. F. Davis is manager.

A concentrating plant and reverberatory furnaces are being put in at La Bufa

by the Bufa M., M. & S. Co. It is the plan to ship high-grade matte instead of concentrates, while at present the ores are treated by the lixiviation process: The high-grade ore is shipped. Development work is being done and a pumping plant has been put in. The nearest railroad point is 160 miles and transportation is by packing. W. Richardson is manager and E. George superintendent.

The Mexican Herald gives the following as the official report of the Cananea Con. C. Co. at Cananea, which shows the company exported during 1902, 19,830 tons of refined copper, 383,513 ounces of silver and 1115 ounces in gold, the total value of which was \$4,826,000 gold. With the improvements made in the machinery of the mines it is expected the output for 1903 will be double that of 1902.

W. G. Campbell of Detroit, Mich., has taken up the placer gold mining properties near Llano Colorado, in the southeast part of the Ures district, near Soyopa, says the Tucson, Ariz., Post, and is making preparations for hydraulic mining. He is building reservoirs by damming the creek, and will conduct the water by ditches, flumes and pipes to the giants.

NEW ZEALAND.

The comparative return, according to official statistics, of gold entered for duty for exportation from New Zealand for the years 1901 and 1902, is as follows:

District—	1901.		1902.	
	Quantity.	Value.	Quantity.	Value.
Auckland	191,968	695,551	201,583	721,977
Marlborough	133	613	601	2,404
Nelson	7,212	28,138	5,947	23,649
West Coast	113,286	454,008	118,796	475,272
Canterbury	142,922	456,833	2	7
Otago	142,940	576,492	181,116	728,114
	455,561	1,753,783	508,046	1,951,433

SPAIN.

HUELVA.

The London office of the Rio Tinto Copper Co., operating at Rio Tinto, reports for the calendar year 1902, giving the following figures (reduced to United States currency at \$5 to the £1):

	1902.	1901.	1900.
Copper, product tons	34,478	35,318	35,733
Average price standard copper per ton	\$32.170	\$33.950	\$35.733
Total profits, rents, etc.	\$7,205,530	\$9,056,750	\$9,729,060
Administration and directors.	321,170	333,915	365,935
Taxes, etc.	\$6,885,360	\$8,712,835	\$9,363,125
Depreciate, interest, etc.	\$6,121,135	\$8,006,045	\$8,779,205
Written off	\$3,089,630	\$6,990,150	\$7,765,865
Added to reserve.	\$69,320	\$91,770	\$15,535
Preferred dividend.	\$4,439,320	\$6,285,390	\$7,272,340
Ordinary dividend.	\$4,088,070	\$5,001,690	\$6,886,035
Profit	\$4,088,070	\$5,001,690	\$6,886,035
Deficit	\$3,480	\$31,510	\$31,510
Total surplus	\$117,735	\$122,225	\$110,270

The average copper contents of the 1,865,289 tons of pyrites treated were 2.51%, against 2.63% in 1901, and 2.74% in 1900—the lowest of any year in the company's history. The maximum was 3.23% in 1884. In the twenty-seven years of its operations the Rio Tinto has treated 34,575,711 tons of ore and has produced 671,771 tons of copper.

SIBERIA.

J. Rosini of the Northwestern Siberian Co. says they have a grant from the Russian Government on a tract of land along the Siberian coast, opposite Nome, of 200,000 square miles. The company was organized by Russians and a half interest sold to Americans, including M. Thompson of Seattle, Wash., T. Greenough of Idaho, F. W. Peck and J. Ramsey. Last

season several American prospectors were sent out and they found both placer and quartz deposits. Near the coast a ledge was located that can be traced for several miles, which averages 40 feet wide, carrying gold values. On two creeks less than 5 miles from the coast placer deposits were located, but they have not been developed. The prospectors are allowed to locate claims varying in length from 500 to 15,000 feet. Contracts are made with them by the company by which they pay 10% royalty to the company. During the summer three stations were built along the coast and the past winter seventy-five Americans and twenty Russians remained there. This season they will have 200 American prospectors in the country. A coal prospect was also found.

Commercial Paragraphs.

J. HAMMOND & Co., Second and Townsend streets, San Francisco, manufacturers of tanks, gallowes frames, quartz mills, etc., have shipped a complete gallowes frame, milled and painted, ready for erection, to a large mining company of Calaveras county, Cal.

On the 15th inst., the board of directors of the Allis-Chalmers Co. declared the regular quarterly dividend of 1 1/2% on the preferred stock, payable May 1st, 1903, to stockholders of record on April 25th, 1903. The preferred stock transfer books closed to-day, and will be reopened on Saturday, May 2d, 1903, at 10 o'clock A. M.

THE Keystone Driller Co. of Beaver Falls, Pa., since the fire last November, have put up temporary buildings and have turned out a number of machines. The company will rebuild their plant there on a larger scale than before. Since they began in their temporary quarters, they have filled several orders for Yukon Territory, have shipped several machines to California and have orders for St. Petersburg, Russia, and Johannesburg, S. A.

DURING the last four months the Pacific department of the Pelton Water Wheel Co. of San Francisco, Cal., report having contracts for water wheels for a number of large hydro-electric plants west of Niagara, the wheels to conform to the speed of the generators, to permit of direct connection, and the heads under which they operate are of both extremes, viz., from 65 feet to 2100 feet. Among these installations is one for the Vancouver Power Co., Vancouver, B. C., three 3000 H. P. units, each main unit to consist of two wheels, one mounted on each end of extended generator shaft—wheels to operate under a 390-foot head at speed of 200 R. P. M.; nozzles of improved Pelton combination deflecting and needle type, hydraulically balanced. The Northern California Power Co., which recently put in three 1600 H. P. Pelton wheels direct connected to Westinghouse generators, have given another order for two 3000 H. P. units to operate under 1150-foot head. By means of flexible leather link couplings, power will be transmitted from both ends of each water wheel shaft to two 1500 H. P. generators, which will run at speed of 300 R. P. M. The Gwin Mine Dev. Co., near Jackson, Cal., are installing a hoist with a capacity of 20,000 pounds at a speed of 1200 feet per minute—power derived from two 9-foot diameter Pelton wheels having triple nozzles which are fitted with two hydraulic hoist operating valves, one valve to control the three gates on each nozzle. This will exceed the capacity of the Utica hoist, which consists of two 10-foot Pelton wheels and lifts 18,500 pounds from 2000 feet depth, speed 700 feet per minute.

Catalogues Received.

A catalogue descriptive of their special design horizontal turbine is sent by the Webster Camp & Lane Co., Akron, Ohio, which contains a summary of a recent test, showing an efficiency of 84%, where but 80% had been guaranteed by them.

In nothing is the advance of science and skill more noticeable than in the present production of catalogues, and in this line nothing of late has appeared superior to the sumptuous brochure on "Mechanical Rubber Goods," sent for a notice by the New York Belting & Packing Co., Ltd., 25 Park Place, New York. It is a model in all hut regulation size. It tells in terse style just what a customer or consumer wants to know about the rubber belting, etc., that the company makes, gives tables, directions, etc., and presents all in a most attractive style. Everything about the handsome little trade treatise is first-class, the illustrations being of unusual merit. The San Francisco, Cal., office is 509 Market street.

PERSONAL.

W. H. BLOOD of San Francisco, Cal., is in Tucson, Ariz.

C. R. WORES of Tucson, Ariz., is in San Francisco, Cal.

W. S. GAGE of New York City, N. Y., is in Valdez, Alaska.

F. C. HARDON of Denver, Colo., is at La Dura, Sonora, Mexico.

W. WHELAN of Cripple Creek, Colo., is in Salt Lake City, Utah.

R. CHRISTENSON has gone to London, England, from Phoenix, Ariz.

H. G. HEFFRON of Salt Lake City, Utah, is visiting in California.

W. E. HUMPHREYS left London on the 18th inst., en route for Denver, Colo.

F. F. THOMAS, manager Gwin Mine Development Co., is in San Francisco, Cal.

I. B. HAMILTON, of Gold Hill, Or., is in San Francisco, Cal., on mining business.

W. G. FILER of Salt Lake City, Utah, has gone to California on mining business.

H. MURRAY, a mine owner of Cisco, Placer county, Cal., is in San Francisco, Cal.

W. C. OREM of Salt Lake City, Utah, is in Silver City, Idaho, on mining business.

J. KNOWLES is superintendent of the Stacy group of mines, near Rollinsville, Colo.

W. G. SCOTT, manager Queen Bess mine, Alamo, B. C., is in Salt Lake City, Utah.

P. J. HICKEY, manager of the Ivanhoe mine, near Slocan City, B. C., is in New York.

G. MOORE, of the Con. Mercur M. Co. slime plant at Mercur, Utah, is in Wisconsin.

S. R. GRAHAM, interested in oil properties near Bakersfield, Cal., is in San Francisco, Cal.

E. C. VOORHIES, superintendent Lincoln mine, Sutter Creek, Cal., is in San Francisco, Cal.

F. EISENBERGER, a mine superintendent of Nevada City, Cal., is in San Francisco, Cal.

P. S. COULDREY, manager Le Roi No. 2 M. Co. at Rossland, B. C., is in San Francisco, Cal.

E. L. BALLOU, millman, goes from Igo, Cal., to Pony, Mont., to take charge of mill work there.

J. WILCOX, superintendent of the Mass copper mine at Mass City, Mich., is in Bisbee, Arizona.

F. H. LATHRAP of Salt Lake City, Utah, has gone to Tonopah, Nev., to examine mining property.

J. NOONAN has resigned as superintendent of the Southern Nevada M. Co., near Searchlight, Nev.

A. BANKS returned to Fort Steele, B. C., last week from a trip to San Francisco, Cal., on mining business.

PRESIDENT S. BAMBERGER of Bamberger's DeLamar mines, is at DeLamar from Salt Lake City, Utah.

T. A. BROWN of Breckenridge, Colo., is in Gilpin county, Colo., examining several mines for Eastern parties.

J. A. JESTER of Boulder, Colo., is superintendent of the Northwestern mine at Caribou, Boulder county, Colo.

F. C. RUTAN of Salt Lake City, Utah, interested in the Annie Laurie mine, near Marysville, Utah, is in New York.

F. SMITH, superintendent of the Wolverine and Mohawk copper mines near Houghton, Mich., is in Bisbee, Ariz.

JUAN FELIX BRANDES, M. E., of Denver, Colo., is inspecting copper properties in New Mexico for New York parties.

E. M. HOLBROOK is general manager of the Horseshoe M. Co. at Deadwood, S. D., succeeding W. L. McLaughlin.

B. DANIELS, owning mines in Danielsville district, near Race Track, Powell county, Mont., is in London, England.

R. P. HILLS of Salt Lake City, Utah, secretary of the Four Metals and Latham M. Cos., is in Omaha, Neb., on business.

D. MCCOOK is superintendent of the Punch Creek mine on Humboldt creek, near Hawkinsville, Siskiyou county, Cal.

J. H. LE NOIR is superintendent Santa Maria mine, at Garvalana, Chihuahua, Mexico, owned by the Santa Maria M. Co.

DAVID MCCLURE, superintendent Gwin mine, Calaveras county, Cal., has returned to the mine from San Francisco, Cal.

F. H. CLARK, formerly of Salt Lake City, Utah, is superintendent of the Trade Dollar Extension mine at Silver City, Idaho.

F. MOREHOUSE returned last week to Salt Lake City, Utah, from an examination of mines in Snake River district, Idaho.

J. H. TIBBITTS, of Redding, Cal., is manager of a group of mines at Shafter, Presidio county, Texas, owned by Arkansas men.

E. H. STAGG of Johannesburg, Kern county, Cal., of the Bagdad mines near Ludlow, Cal., is in the East on company business.

G. E. PIERSON, manager Pierson group of mines near Ouray, Colo., returned last week from Cleveland, Ohio, and Kansas City, Mo.

E. R. ABADIE, superintendent of the Champion mine at Nevada City, Cal., returned this week from a trip to San Francisco, Cal.

JAMES CONSTABLE has resigned as superintendent Virginia mine, Greenhorn, Or., and will resume his mining operations in Alaska.

G. L. KAEDING AND O. C. ZINNS of San Francisco, Cal., have gone to Tuolumne county, Cal., to examine mines near Tuttletown.

J. W. GALIGHER of Salt Lake City, Utah, has gone to Valdez, Alaska, to look after his mining interests in the Copper River district.

A. A. ROSS of Prescott, Ariz., is superintendent of the Southern Nevada M. Co., operating near Searchlight, Nev., vice J. Noonan, resigned.

J. S. PALMERLEE is president and general manager of the Huachuca Con. C. Co., operating in the Huachuca mountains, near Bisbee, Ariz.

B. L. LUNCFORD of San Bernardino, Cal., formerly at the Iron Chief mine in Arizona, is assayer for the Gold Roads M. Co., near Kingman, Ariz.

W. J. SHARWOOD, E. M., left San Francisco, Cal., on the 22nd inst. for Marysville, Mont., to resume cyaniding tailings at the Drum Lummon mine.

W. A. FARISH, JR., of the Majestic M. Co. has returned to Salt Lake City, Utah, from a visit to the mines of the "Mother Lode," in Tuolumne county, Cal.

SUPERINTENDENT C. ROOD of the Ontario mine at Park City, Utah, returned last week to Salt Lake City, Utah, from a trip to San Francisco, Cal.

H. M. CROWTHER of Salt Lake City, Utah, consulting engineer of the Blue Acre Copper Co. at Blue Acre, Beaver county, Utah, is in the East on business.

A. J. OREM returned last week to Salt Lake City, Utah, from the East, where he has been in the interest of the Trade Dollar Extension Co. of Silver City, Idaho.

W. T. MACDONALD left Los Angeles, Cal., on the 11th inst., for Zapote, Chihuahua, Mexico, where he goes as superintendent Palmarejo mill and reduction works.

H. A. KELLER, consulting engineer of the Horseshoe M. Co., Deadwood, S. D., recently returned to San Francisco, Cal., from a visit to the mines and went to Mexico on mining business.

H. H. CLAUDET, representing the Elmore Oil Process, is in San Francisco, Cal., procuring machinery for a 50-ton oil ore concentrating plant, which he will put in at Le Roi No. 2, Rossland, B. C.

C. R. VAN HISE, a noted American geologist, and connected for several years with the United States Geological Survey, has accepted the presidency of the University of Wisconsin, at Madison, Wis.

T. H. OXNAM, who resigned the management of the Palmarejo mines some months ago, has been reappointed general manager of the same property, also managing director of the Huruapa mines in the same district.

F. L. SIZER, who is operating the Rosario mine, at Guadalupe y Calvo, Chihuahua, Mexico, is in San Francisco, Cal., on his way to Montana, where he is consulting engineer for the Kimberly-Montana G. M. Co., near Helena, Mont.

GARDNER F. WILLIAMS, a noted mining engineer, formerly of California, now manager of the De Beers Consolidated Mines, Ltd., owning the diamond fields of Kimberley, in South Africa, with whom he has been for the past eighteen years, is visiting in San Francisco, Cal.

H. R. SKINNER AND H. H. NOYES are in San Francisco, Cal., en route for China, to investigate the feasibility of importing 100,000 Chinese laborers to work in the gold mines of the Transvaal. Noyes says since the Boer war mining in South Africa has gone ahead rapidly, but the future development is hampered by the want of cheap labor. There is not sufficient Kaffir labor to operate the mines, and the Chamber of Mines of South Africa has undertaken to solve the labor question by looking into the feasibility of importing Chinese labor. The idea of employing white labor is out of the question. White men will not work alongside of Kaffirs. It is thought that under governmental regulations they will be able to get sufficient Chinese labor to meet the conditions. As to the capabilities of the Chinese as mine workers, in the tin mines of the Malay peninsula, which produce four-fifths of the world's supply of tin, they are employed with success. The questions involved in the scheme to import coolie labor into the Transvaal are more of a political nature. There are political objections to the importation of Chinese labor, such, possibly, as exist in the United States. They hope to secure the passage of laws in advance of the importation of any laborers, so that the whole business may be carried on under governmental supervision. The Chinese will be indentured in China and taken to South Africa for a fixed term of years, and on the expiration of this term of service will be returned.

Obituary.

H. P. GILLESPIE, a pioneer mining man of Aspen, Colo., but formerly of Denver, died on the 19th inst. in South America. He was touring the world, accompanied by his wife and two sons. In 1886 he was a candidate for Lieutenant-Governor of Colorado. He discovered the Spar mine in 1881 and was part owner of the Moffie Gibson property in Aspen district.

New Patents.

DEWEY, STRONG & CO'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING APRIL 14, 1903.

725,198.—GAS APPARATUS—D. Barnard, Bakersfield, Cal.

725,523.—GLOVE FASTENER—A. Bernauer, S. F.

725,612.—CRUTCH—G. C. Calentine, Tacoma, Wash.

725,410.—VEHICLE WHEEL—M. J. Clark, Chaparral, Ariz.

725,051.—BOTTLE—T. C. De Hart, Oakland, Cal.

725,052.—WEATHER STRIP—W. C. Dillon, Los Angeles, Cal.

725,230.—MITER FINISHER—Duncan & Byars, Norwalk, Cal.

725,087.—RAIL JOINT CHAIR—T. Elrod, Cool, Cal.

725,431.—CALENDAR—W. M. Finch, Willow, Cal.

725,340.—CALKING APPARATUS—C. G. Hightower, S. F.

725,621.—WINDOW SASHES—E. Hipolito, Los Angeles, Cal.

725,093.—WATER GATE—W. H. Kiler, Pomona, Cal.

725,348.—FOLDING CHAIR—F. T. B. Mann, Long Beach, Cal.

725,581.—GAR DOOR—D. E. McLaughlin, Tacoma, Wash.

725,463.—GAS GENERATOR—C. W. Metcalf, San Diego, Cal.

725,351.—RAILWAY TRACK—P. Montsahre, Fresno, Cal.

725,582.—MOWING MACHINE—R. L. Nevills, S. F.

725,124.—WRENCH—R. J. Northam, Hollywood, Cal.

725,184.—OIL BURNER—J. Proper, Oceanpark, Cal.

725,371.—WEIGHING MACHINE—G. F. W. Schultze, Berkeley, Cal.

725,156.—GAME—Seyfried & Sheslor, S. F.

725,518.—HOOK—J. Wahlberg, Eureka, Cal.

725,304.—RAIL BRACE—D. M. Watson, Portland, Or.

725,524.—HAT BAND—W. A. Wetmore, S. F.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

FISHERMAN'S HAT BANDS.—No. 725,524. April 14, 1903. W. A. Wetmore, San Francisco, Cal. This invention is especially designed for fishermen's use. It consists of a flexible band adapted to pass around the hat, said band forming a continuous strip or having a series of independent sections of cork or similar soft material of suitable width and thickness adapted to receive the points of hooks, so that the fisherman may carry a number of hooks and files conveniently fixed to the hat and avoid the necessity of carrying a fly-hook or other receptacle. The bands may also have clips or other devices to safely hold leaders, which may be wound around the hat.

GLOVE FASTENER.—No. 725,523. April 14, 1903. A. Bernauer, San Francisco, Cal. This invention is designed to provide a means for independently and adjustably connecting the sides of the glove opening at as many points as may be desired along the line of said opening. It consists in a

novel fastening whereby the wrist opening of the gloves may be adjustably drawn together and independently locked at different points from one end to the other, so that the gloves may be made to fit wrists and arms of varying sizes and a smooth fit maintained.

FEED WATER HEATER AND FILTER.—No. 724,661. April 7, 1903. A. de Brattville, San Francisco, Cal. This invention relates to improvements in means for purifying and heating water before it is admitted to the boiler, and it is particularly intended for use in connection with marine engines. The invention consists of a casing inclosing independent upper and lower chambers, filter compartments in the upper chamber, means for admitting water successively to said filter, through each of which it flows in downward course, connections through which the filtered water is delivered into the lower chamber, plates over which said water passes, means by which said chamber and plates are heated, and other details of construction by which the desired object is attained.

ATTACHMENTS FOR LOCKS.—No. 724,869. April 7, 1903. A. W. Livingston, Alameda, Cal. This invention relates to improvements in door latch and door lock attachments which are intended to retain the latch or bolt in a retracted position when the door is open, so that the end of the bolt will be flush with the front edge of the door, adding to the appearance of the latter, allowing the door to close easily, and avoiding the projecting points which so frequently catch and tear the clothing. It consists in a device of the character described, a housing plate having flanges at opposite sides, and a reversible drop plate pivoted interchangeably in said housing, said drop plate having an arm on its lower edge projecting from its pivoted end and movable exterior to the housing.

Latest Market Reports.

SAN FRANCISCO, April 24, 1903.

METALS.

SILVER.—Per oz., Troy: London, 23½d (standard ounce, 925 fine); New York, bar silver, 50½c, refined (1000 fine); San Francisco, 50½c; Mexican dollars, 38 @ 39½c San Francisco, 39c New York.

A further advance in the price of silver is noticeable. The gain thus far is too small, however, to give stimulus to silver production, and no particular effort is being made to increase it.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$15.00 @ 15.25; Electrolytic, 1 to 3 casks, \$15.00 @ 15.25; Casting, 1 to 3 casks, \$14.50 @ 14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £61 7s 6d spot per ton.

Copper shows no material change since last week's quotations in New York, but there was a small falling off in London. The output of copper in the Lake region in March was 17,110,000 pounds, valued at \$2,566,500.

LEAD.—New York, \$4.67½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £12 10s per long ton = 2.750 per lb.

SPELTER.—New York, \$5.70; St. Louis, \$4.60; London, £22 15s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$29.50 @ 29.75; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33c; bar tin, \$33, 35c @ 37½c. London, £136 10s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19.00; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @ 46.00; 70½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17.15c.

NICKEL.—New York, 50 @ 60c @ 1b.; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.35; gray forge, \$20.50; San Francisco, bar, 3c @ 1b., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$22.50 @ 23.50
Foundry Northern 1.....	22.00 @ 23.00
Northern 2.....	22.00 @ 22.50
Northern 3.....	21.50 @ 22.00
Southern 1.....	21.85 @ 22.85
Southern 2.....	21.35 @ 22.35
Southern 3.....	20.85 @ 21.85
Forge.....	20.35 @ 21.35
Charcoal.....	26.00 @ 27.00
Billets, Bessemer.....	33.00 @ 34.00
Bars, iron.....	1.85 @ 1.90
Bars, steel.....	1.75 @ 1.80
Rails, standard.....	28.00 @ 30.00
Rails, light.....	34.00 @ 40.00
Plates, boiler.....	1.90 @ 2.00
Tank.....	1.75 @ 1.90

Sheets, 26 store.....	2.90@ 3.00
No. 27.....	3.00@ 3.10
No. 28.....	3.10@ 3.20
Angles.....	1.75@
Beams.....	1.75@
Tees.....	1.80@
Zees.....	1.75@
Channels.....	1.75@
Steel melting scrap.....	18.50@19.00
No. 1 railroad wrought.....	20.50@21.50
No. 1 cast, net ton.....	18.00@19.00
Iron rails.....	24.50@25.00
Car wheels.....	24.00@24.50
Cast borings.....	10.00@10.50
Turnings.....	14.50@15.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.25; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for car-load lots.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15¢; less than one ton, 17¢. No. 1*, 60%, carload lots, 13¢; less than one ton, 15¢. No. 1** 50%, carload lots, 11¢; less than one ton, 13¢. No. 2, 40%, carload lots, 10¢; less than one ton, 12¢. No. 2* 35%, carload lots, 9¢; less than one ton, 11¢. No. 2** 30% carload lots, 9¢; less than one ton, 11¢. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10¢ per set; 14oz., 40s., 9¢.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$3.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, boiled, bbl., 56¢; cs., 61¢; raw, bbl., 54¢; cs., 59¢; Lucol oil, boiled, bbl., 50¢; cs., 55¢; raw, bbl., 48¢; cs., 53¢. Kerosene—Pearl, per gal., 22¢; Astral, 22¢; Star, 22¢; Extra Star, 25¢; Eocene, 24¢; Elaine, 24¢; Water White, in bulk, 16¢; Mineral Seal, iron bbls., 18¢; wooden bbls., 21¢; cs., 24¢; Mineral Sperm, cs., 26¢; Deodorized Stove Gasoline, bulk, 17¢; do., cs., 23¢; 86° Gasoline, bulk, 21¢; do., cs., 27¢; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16¢; do., in cs., 22¢; c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75¢; cs., 80¢; Sperm, crude, 50¢@60¢; Natural White, 65¢; Bleached do., 70¢; Whale Oil, cs., 50¢@55¢.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25¢@26¢ lb.; carloads, 23¢@24¢; in tins, 35¢; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 21¢@22¢ lb.; caustic soda, in drums, 3¢@4¢ lb.; Cal. s. soda, bbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12¢@13¢; nitrate of potash, bbls., 10¢; caustic potash, 10¢ in 40-lb tins; borax concentrated, 7¢@8¢ lb.; roll sulphur, 4¢@6¢; powdered sulphur, 2¢@3¢; flour sulphur, French, 2¢@3¢; alum, \$2.00@2.25; California refined, 2¢@2½¢; sulphide of iron, 9¢ lb.; copper sulphate, 5¢@7¢; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66¢ B, 2½¢ lb.; nitric acid, in carboys, 8¢ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., per lb., 6½¢; in 25-lb. tin pails, 4¢ per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4¢ per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6¢; do. in kegs, 6½¢.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6¢; less than 500 lbs., 6½¢.

LITHARGE.—Pure, in 25-lb. bags, 8¢@9¢ per lb.

BONE ASH.—Extra No. 1, 5¢@6¢ per lb. No. 1, 4¢@5¢.

BORAX.—Concentrated, 7¢@9¢ per lb. powdered, 9¢@12¢; fused, 25¢@30¢.

BISMUTH.—Subnitrate, per lb., \$1.60.

BONE ASH.—4¢ lb.

BORAX.—Crystal, 5¢; calcined, 25¢.

COPPER.—Sulphate, 5¢@7¢.

MANGANESE.—Pure, lb., 60¢.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

SODIUM.—Metal, lb., \$1.00.

MERCURY.—Bichloride, lb., 90¢.

PHOSPHORUS.—(American) lb., 75¢.

SILVER.—Chloride, lb., 90¢@1.00; nitrate, 55¢.

URANIUM.—Oxide, lb., \$3.50.

ZINC.—Metallic, chemically pure, lb., 50¢; dust, lb., 10¢; sulphate, lb., .04¢.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

SITUATIONS WANTED.

ANALYTICAL CHEMIST DESIRES POSITION as Assayer or as Chemist in charge of cyanide plant. Thorough knowledge of cyanide process and treatment of difficult ores a specialty. Highest references. Address "Cyanide," care Mining and Scientific Press, 330 Market St., San Francisco.

A COMPETENT, PRACTICAL CYANIDE MAN, Assayer and Chemist, with thirteen years' experience, wishes position. Have built two of the largest plants in the U. S. Best of references furnished. Address "Jackson," care of this office.

COMPETENT MILLMAN, MACHINIST AND Chemist. Experience free mill and concentrating. College education. Have built and operated mills in Montana for 12 years. Competent accountant and able to administer affairs of a company. Would like situation with a company out of a promoter's hands. References the best. Address H., care this office.

CYANIDE CHEMIST OR MILL SUPT. TECHNICAL graduate. Specialty, construction; also, successful treatment of low grade ore and smelting. Good references. Address "Spanish," this office.

MINE FOREMAN WISHES A CHANGE OF position—foreman or superintendent. Age 37. Experience, 13 years. Can assay and survey State locality and salary paid. No objection to South America or Mexico. Some knowledge of Spanish. Address M. O. I., this office.

MINING SUPERINTENDENT, FOURTEEN years' successful experience in management of mine, with best of references, desires situation. Address N. F., this office.

PHYSICIAN DESIRES POSITION WITH MINING company in California. Graduate of University of California. Excellent hospital experience. Please address L., this office.

SUPERINTENDENT OR MANAGER.—MAN of 35, with fifteen years' practical experience in mining, metallurgy, an chemistry, understands handling labor, accounting, purchasing of supplies, etc., desires position. Will examine, report and develop properties. Plan and erect plants. For ten years foreman, metallurgist and superintendent of two of the largest copper companies in the West, and at present manager of a copper property in Mexico. Strong and references. Address J. G. B., care of this office.

WANTED.—A POSITION AS HYDRAULIC AND Placer Mining Foreman. Have 20 years' experience. References given if required. Willing to go to Alaska or foreign country. Address F. A. Smith, French Corral, Nevada Co., Cal.

WANTED.

Metallurgist and Smelter is open for engagement to take charge of copper property. Thoroughly experienced in mining and treating low grade ores. Position preferred in Latin America. As assayer and analyst, age 35, sl. gl. excellent references. Address "Cohre," care of Mining and Scientific Press.

WATER WORKS BIDS.

TUCSON, ARIZONA, April 30th, 1903.

SEALED BIDS, ADDRESSED TO MAYOR O. F. Schumacher, Chairman of Water Committee, City of Tucson, Arizona, for furnishing of a Tucson, Arizona, 1 Cross-Compound Crank and Fly-Wheel High-Duty Pumping Engine, with a capacity of Four (4) Million Gallons in one day of 24 hours, against a total head of 60 pounds per square inch, with steam pressure at engine throttle of 100 pounds per square inch. Pumping engine must have guaranteed duty of 115 million foot pounds, with 1000 pounds of steam with pressure at throttle of 100 pounds per square inch. Copy of specifications furnished on application, or may be seen at office Supt. of Water Dept., Tucson, A. T. Bids will be opened at 12 o'clock noon at City Hall, Tucson, A. T., Wednesday, May 20th, 1903. Bidders must furnish their own drawings for the type of engine submitted. A certified check on a responsible bank for 10% of the amount of bid, made payable to City Treasurer J. A. Legarre, must accompany each bid. The Mayor and Common Council reserve the right to reject any or all bids.

C. F. SCHUMACHER, Mayor.

F. S. TREAT, City Clerk.

COMPRESSORS, ROCK DRILLS, GASOLINE HOISTS

Write for Prices.

NORMAN A. ROOT,

519 MISSION ST., SAN FRANCISCO, CAL.

TO LEASE, 160 ACRES OF PROVEN PLACER GROUND IN SIERRA CO., CAL.

ADDRESS H. R., THIS OFFICE.

PRINTING We furnish all stock and do printing at the following prices: 100 envelopes 40 cts., 500 \$1.25, 1000 \$1.75. Bill heads, note heads, cards, tags, etc., at same price. Samples of work free. Pacific Commercial Co., 325 Davis St., San Francisco, Cal.

HELP WANTED.

WANTED.—Millman for 5-Stamp Mill; one who is somewhat of a Mechanic.

Address, with references, D. A., this office.

Wanted---A Superintendent

For foundry, forge, machine and boiler shops employing 20 men. Should be posted on mining machinery, structural work and up-to-date methods. Permanent position in excellent location. State qualifications and experience fully and salary expected. Answers confidential. Address Z., P. O. box 153, Station C, Los Angeles, Cal.

WANTED.

WANTED--MILL TAILINGS,

Gold, silver or lead, in New Mexico, Arizona or old Mexico. Will buy or lease fine location, quantity and value. A. E. VAN VELSAN, Telluride, Colorado. Box 181.

MINING STOCKS WANTED.

If you are a stockholder in any good going mining company and want to sell your shares

WE CAN GET YOU CASH.

Send for our price list of 500 stocks. It tells what we will buy and what we will sell.

CATLIN & POWELL, 94, 35 WALL ST. NEW YORK.

WANTED.

ELECTRICALLY DRIVEN DIAMOND DRILL

(Sullivan Drill preferred) with swinging head and pump connected, capable of drilling 300 feet, adapted for underground work, and requiring about 6 H. P., rods ranging from 1 to 5 feet. Apply 225 Crocker Building, San Francisco, Cal.

PICHER

Natural Blue Lead Paint.

Best protective paint for all iron and steel surfaces. Withstands the action of sulphuretted hydrogen gases. Send 25 cts. to cover express charges for one quart and illustrated booklet free.

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and Builders of Concentrators

FOR LEAD, ZINC, GOLD AND SILVER.

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Annual Meeting.

The Regular Annual Meeting of the Stockholders of the GWINN MINE DEVELOPMENT COMPANY will be held at the offices of the Company, Nos. 1208-11 Claus Spreckle Building, San Francisco, California, on **TUESDAY** the 28th day of April, 1903, at the hour of 2 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the Meeting.

Transfer books will close on **WEDNESDAY**, the 25th day of April, 1903, at 12 o'clock noon.

J. J. CRAWFORD, Secretary.

Office—No 1211 Claus Spreckle Building, San Francisco, California.

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The Stimulus of Mining Activity.

The discovery of new mining districts is no longer the result of accident, but of the intelligent search for mineral by men trained by years of experience in this business. The prospector is a man to whom the mining world owes much. He is a man of sanguine temperament, often—usually—disappointed, but rising hopeful again he continues his search, across desert plains, through rugged mountains, and into almost impenetrable thickets. In some instances the obstructions to his progress are so great that several days are required to reach some objective point but a short distance away and within plain sight. The discoverer of the mines of Rossland, B. C., was several days in reaching the objective point of his search after having made up his mind to visit a particular red mineral-stained hill. He was hampered by fallen timber, dense thickets and deep torrents of icy cold water, but he persevered, found and located some of the best mines in the district, though he did not profit largely by his find—the discoverers of great mines seldom do.

Butler, the discoverer of Tonopah, went into the desert of southern Nevada when there was no unusual activity in that region. He went, believing that in that broad region, which had produced bonanza mines before, there still remained a good chance to make new discoveries of value. He made a discovery, the Mizpah mine, and sold out at a moderate price, sustaining the reputation the prospector has for disposing of great mines for nominal sums.

That the last great mine has been discovered in Nevada, or in Arizona, Colorado or California, or in any other great mining region no one believes, but what is required to stimulate the search is the discovery and development of a rich mine. When this occurs the immediate neighborhood is quickly scoured by prospectors who search everywhere, and take many chances which at other times would not be given a moment's consideration. Claims are located and shafts started upon nothing. That there is no surface indication is apparent, but the hope of rich veins or deposits below stimulates this class of



The Osborne Mill; First in Tonopah, Nevada. (See Page 279.)

prospecting and often satisfactory results follow.

Occasionally in old mining districts, where mining has been carried on successfully for years, a new find is announced where the existence of pay ore was not even suspected. Discoveries of this class are sometimes made in old mines, where crosscuts are driven or diamond drill holes have been bored. A discovery of this character has the same stimulating effect upon an old district that is so noticeable in a new one. And this renewed activity in an old camp can usually be measured by the value of the initial new discovery. If it is a bonanza, development is given an impetus throughout the district, and this sometimes extends far beyond the immediate vicinity of the new find. If it be of good but not of extreme value, the result of the stimulant is only noticeable locally.

Such great development as that of the gold-bearing hanket of the Witwatersrand has a stimulating effect upon the whole world, but here, too, the ratio of the value of the development to the intensifying of mining activity is proportional in the same degree that a more or less important one would be.

The extensive development, equipment and successful operation of such mines as the Homestake, Treadwell and some of the great copper mines has stimulated search for large mines which will afford a reasonable but assured margin of profit. Such operations as these have done much to place mining where it properly belongs, upon a legitimate basis, and on the same plane as other investments of equal commercial importance.

Imperfections of the Mining Law.

Mining law is based on the equity of rights, and in the United States mining laws may often be traced a similar outgrowth of existing mining laws to those in older countries. The law, generally speaking, is the outgrowth of customs more or less local in their character. Some of the most important mining laws seem to have been based upon the conception of ideal conditions as related to the geology of veins; but, unfortunately, such conditions rarely obtain in nature, and as a result we find perplexing questions involving the rights of parties in dispute. The extralateral right law is probably a more fruitful source of mining litigation than any other law, and the United States is the only country in the world in which this law is at present in force. It was tried for a short time in British Columbia, and lawsuits resulted so quickly and in such number that the law was hastily repealed, but the litigation which was the speedy outgrowth of the law in that province has not wholly been settled yet.

The law of the extralateral right evidently conceived a system of veins parallel in dip and strike, which if followed downward on their dip to indefinite depth, yet within proscribed longitudinal limits, could never give rise to conflict; yet, the law framed contemporaneously seemed to anticipate the possibility of a union of veins in depth, when the right to follow the vein beyond the point of intersection is given to the senior locator. The mining law now in force requires parallel end lines, but it does not require these end lines to be laid at right angles to either the side lines of the claim or to the strike of the vein, and herein is an additional source of trouble, as the extralateral right must be exercised in the territory lying between the end lines projected outwardly and downwardly in the direction of the dip of the vein. Adjoining claims located on the same vein may have their end lines converging toward each other, when the extralateral right will come into conflict. The Supreme Court has recently decided questions of this character in the *Cœur d'Alene* cases, where there were several conflicting rights based upon the existing law. In deciding these cases the priority of location has determined the several respective rights.



O'Meara-Lynch Dump; Two Thousand Tons Ore, Tonopah, Nevada. (See Page 279.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
The Osborne Mill—First in Tonopah, Nevada.....	275
O'Meara-Lynch Dump—Two Thousand Tons Ore, Tonopah.....	275
The Late Irving M. Scott.....	280
The Late Victor M. Clement.....	280
The Elmore Process of Concentrating Ore.....	281
Water Hoisting in the Anthracite Region.....	283
Industrial Railway in Boiler Room.....	284
Mining and Metallurgical Patents.....	285
EDITORIAL:	
The Stimulus of Mining Activity.....	275
Imperfections of the Mining Law.....	275
An Air-Tight Drift.....	276
Expensive Water Supply.....	276
Mine Taxation.....	276
Immigration and the Miner.....	276
Decision in Seven Stars Case.....	276
How Much Metal the Ore Contains.....	276
MINING SUMMARY	287-288-289-290-291-292
LATEST MARKET REPORTS	293
MISCELLANEOUS:	
Concentrates.....	277
Treatment of Oxidized Silver-Lead Ores of Aspen, Colo.....	278
Removing Obstructions from Drilled Wells.....	278
Care of Hoisting Ropes.....	278
Copper Deposits of the Sierra Oscura, New Mexico.....	279
Gold in Brazil.....	279
A Most Interesting Process.....	279
The Mines of Tonopah.....	279
The Late Irving M. Scott.....	280
Death of Victor M. Clement.....	280
Factor of Safety for Winding Ropes.....	280
The Elmore Process.....	281
Milling at the Camp Bird, Colo.....	282
The Manufacture of Plaster of Paris.....	282
Water Hoisting in the Anthracite Region.....	283
Boiler Room Economy.....	284
Midsummer Measurements of California Streams.....	284
Oil Refineries in California.....	284
Accidents Due to Combustion Within Air Compressors.....	284
Mining and Metallurgical Patents.....	285
Gold Milling Practice in Bendigo.....	286
Personal.....	292
Obituary.....	292
Catalogues Received.....	292
Commercial Paragraphs.....	292
New Patents.....	293
Notices of Recent Patents.....	293

An Air-Tight Drift.

One of the latest and most novel ideas in mining has been put into practice in the Moose mine, on Raven hill, Cripple Creek, Colo. In one of the lower levels a drift was run, along the length of which fissures were cut, from which large volumes of gas appeared to issue into the workings. The miners worked with greatest difficulty, although the ventilating plant was largely augmented on the surface. The drift was timbered with square sets and tightly lagged; but these precautions did not shut off the flow of gas. Finally the unusual and ingenious expedient was tried of lining this drift from the shaft to the face, a distance of 600 feet, top, bottom and sides, with asbestos sheets reinforced with a sheeting of tin plates. This, the local press asserts, has had the desired effect of shutting off the flow of foul gas. The apparent success of this experiment suggests the possibility of holding swelling ground in the same manner. Ordinarily, ground which is found to swell in mine excavations does not do so rapidly, it often being several days before the swelling becomes noticeable, or, at least, troublesome. It is supposed to be due to the effect of the contact of the rock with the atmosphere. If, as the drift advances, the workings be lined with some substance which will hermetically seal the rock from contact with the air, the expense and trouble caused by the increase in volume of the rock may be obviated. This is not a new theory—it has often been advanced before, but until the present no attempt has been made to exclude air from contact with the rocks surrounding a drift, or for the purpose of shutting off a flow of foul gas. It is worth a trial, at all events, and in this a solution of the problem may have been found. It is not improbable a less expensive and more flexible material than sheet tin may be found. This, however, would be a matter for experiment.

Expensive Water Supply.

One of the most noted mining regions of the world to-day is in Western Australia, about the region known as Kalgoorlie and Coolgardie. The mines upon development have proven large and rich. The ores are chiefly gold-bearing and are usually associated with tellurium. The region is arid and almost destitute of water, with a light and uncertain rainfall. The lack of water placed an almost prohibitory handicap upon extensive mining operations, but it was found in sinking shafts that often water was found, though in small amount, but this water was salt and unfit for domestic use. The Government came to the aid of the miners and established condensing plants at various places, from which water was distributed to the miners and to the towns. Realizing the impossibility, under existing conditions, of the greatest development of the mines of the region, a pumping system has been completed at a cost of over \$14,000,000. The main line is 387 miles in length, constructed of 2½-foot steel pipe. The reservoir is at Helena, near the sea, where a dam has been built which impounds 4,600,000,000 gallons of water. There are twenty stations and sixty-five pumping engines on the line. It is estimated that the operation and maintenance of the plant, with a nominal interest charge, and a sinking fund based on a twenty-year limitation, will require an annual income of about \$1,500,000. To realize this sum not less than 2,500,000 gallons of water must be sold daily at an average price of about \$1.60 per 1000 gallons. It is thought that at first the demand for water will fall somewhat short of this amount, but as extensions are made, and as irrigation is also in contemplation, the amount of water required is expected to increase beyond this. The system has a capacity of 5,000,000 gallons daily.

The miners undoubtedly will build settling reservoirs and buy only such water as is actually necessary in their operations. Ordinarily 1000 gallons of water are required to crush and amalgamate a ton of gold ore, but this varies within considerable limits. At many low-grade mines, such as are well known in America, a tax of \$1.60 per ton for water alone would be prohibitive, but in Australia the conditions are exceptional. The mines are on an elevated plateau, 380 miles from the nearest large water supply. The plant has been seven years in construction and is of large proportions, the largest in the world, though possibly not the most expensive, but assuredly the most elaborate and costly that has ever been built for mining. The mines of the region are rich and it is said by the managers that they can easily afford the additional expense—in fact, it will result in a saving of several shillings per ton in operating, and it will also admit of extending the scale of operations, which has heretofore been impossible by reason of limited water supply.

Mine Taxation.

The law taxing the net profit of mines operating in Idaho, passed by the last Legislature of that State, is seemingly in danger of being attacked—not by the miners, but by other classes of property holders, who maintain that the law discriminates in favor of the miner; that the farmer has to pay taxes upon his farm each year, whether he has a good crop or not, but that the miner, during any year that his mine fails to yield a dividend, escapes taxation. Those opposed to the law, which they claim to be unconstitutional, say a mine is property, and, being such, should be taxed, the same as any other property, whether it be profitable property or not. A mine that is unprofitable is certainly property, but of a most undesirable kind. If the ores within a mine can not be made to yield a profit, abundant and timely rains and weeks of sunshine do not render it more profitable. The only hope of realizing a profit is by the expenditure of more money for the purposes of further development or extension of plant, when success may ultimately result. Although the mining wealth of a nation is its mainstay and the real basis of its prosperity, there are few laws which favor the miner as against other classes. Usually the miner is the one who has to shoulder the load, and upon him is placed the burden of proof as against his agricultural neighbor.

Immigration and the Miner.

The report of the Immigration Commissioner, recently issued, shows that the total immigration into the United States for the nine months ending March 1 last was 494,425, as against 370,575 for the corresponding months of last year. Of this large immigration, Italy supplied the largest number, the total (including Sicily and Sardinia) being 129,800. The next largest contingent came from Austria-Hungary, which contributed 123,234, and Russia (including Finland) sent 81,731. Every country in Europe sent its quota, and some Asiatic countries, notably Japan, are represented. However, a large number of these immigrants are of a desirable class, but the vast hordes from Italy, Austria-Hungary, and Finland are the least desirable element. The greater number are abjectly poor, and as a large percentage of them go to the mining regions of the United States the subject is of interest to miners, not only native born but naturalized citizens. Everywhere miners are organized or organizing for higher wages, shorter hours and improved conditions, but how these can be maintained when once secured—at the cost, generally, of a struggle—seems difficult of solution. These people must live, now that they are here, and to live they must obtain work, but a high standard of wages or work can not be maintained when the labor market is continually flooded with the class of laborers here referred to.

In connection with this may be mentioned the fact that during the recent labor demonstration in Amador county, Cal., a number of men marched in the processions which paraded the streets who were unable to speak or understand a word of English, and still wore the tags which are secured to their coats when they first reach America, showing them to be among the latest to arrive.

These men know nothing of our form of government, our laws, or our institutions, but they are already or soon will become competitors in the labor markets, and in the face of this condition, which does not improve in the least with time—indeed, threatening to get worse—no standard of wages that an American can afford to accept will long be possible.

Decision in Seven Stars Case.

The Supreme Court of the United States has decided the long contested case involving the ownership of the Hillside mines, in western Yavapai county, Arizona. In 1891 John Lawler and associates sold the group of mines, of which the most important was the Hillside claim, for \$450,000. The deed was placed in escrow, the money to be paid in installments to the owners of the property. A large cash payment was made and the purchasers incorporated as the Seven Stars Mining Co. It was extensively advertised, both in America and Europe, and a large amount of stock sold on excessive capitalization. It was alleged by the stockholders that the prospectus contained many misstatements, and an effort was made to hold Lawler and Wells, who were the principal owners of the property at the time of the sale, responsible for the misstatements made by the promoters of the company. The Supreme Court of Arizona decided the case in favor of defendants, and the case was appealed to the United States Supreme Court, which has now affirmed the opinion of the lower court, the court holding that Lawler and Wells were not cognizant of the misrepresentations made by the promoters; and even had they been informed on the subject, they could not have been held responsible. The decision is important, as it releases a valuable mine from the bonds of litigation and establishes a precedent by which others may be guided.

WHAT the intending investor in a mine wants to know is, how much metal the ore contains, the amount of ore available, the cost of mining and of reduction, and the probable length of time required to exhaust the visible supply. He cares little about the genesis of the ore deposit, how the gold or silver or copper or other metals came into the ore. He wants to know how to get it out in the shortest possible time at the least possible cost. If promoters' reports dealt more with substantial, pertinent facts and less with fancy and unnecessary scientific information, the man with the money and he could more quickly come to an understanding.

CONCENTRATES.

A 3-FOOT water wheel under 1000 feet head, with 221.15 miner's inches, will develop 534 H. P. The wheel will run at 807 revolutions per minute, the spouting velocity of the stream being 15,216.89 feet per second.

A NOZZLE may be directed to either the top or bottom of an impact water wheel to drive the wheel in a given direction, but in directing the stream to the top of the wheel there will be a loss of head equal to the diameter of the wheel.

By ferro-concrete is meant concrete formed of broken rock, sand and cement, reinforced by iron bars of various shapes or sizes. Wire introduced into concrete pillars and walls is said to add largely to its strength; particularly is this the case with pillars wrapped around with wires.

DAHLONEGA, Ga., was one of the earliest gold mining districts in the United States. Early miners in California learned from Georgians the rudiments of placer mining, but the inventive genius of the Argonauts quickly devised better methods than those of early mining in Georgia.

MINING or other corporations organized in any State or territory of the United States may incorporate under the laws of any other State or Territory. There is considerable difference in the corporate laws of the several States, particularly as related to assessments and personal liability of stockholders.

WHERE two placer claims adjoin, each owned by the same person or association, the annual assessment work may be done on one of these claims for the benefit of both. If \$200 worth of work is performed on the lower claim it "represents" both, whether the claims were acquired by location or purchase.

AMALGAM RETORTS sometimes burst, but the cause is not always easy of determination. In some instances it has been thought to be due to moisture in the amalgam creating steam, but mercury when vaporized is a gas, with the same expansive tendency as steam, and is as likely to cause an explosion or disruption of the retort as steam.

THERE is an atmospheric pressure reduction of about one-half pound per square inch for every 1000 feet of ascent. The losses at high altitudes, for which allowance should be made in installing an air compressor, are about 7% for $\frac{1}{2}$ mile, and 34% at 2 miles. At that height the atmospheric pressure per square inch is 9.88 pounds, at sea level 14.7 pounds.

IN Spanish American countries most of the placer mining done by the natives is with the batea, a shallow wooden bowl. With this in hand they stand in the water of a stream and scoop up the sand from beneath the water, quickly washing away the debris, the gold accumulating in a small depression in the center of the batea. Sluicing is with them almost unknown.

AMALGAM coming from stamp batteries is never clean. It always contains pieces of steel and iron and fragments of detonating caps from the mine, as well as many other substances derived from various sources. The small particles of iron and steel worn from the shoes and dies also work into the amalgam, which should be thoroughly cleaned before retorting, or the grade of bullion will be unnecessarily low, for it is difficult to slag off all of the foreign substances included in the gold sponge.

THE gold-bearing alluvials of the Gold Coast, West Africa, extend over a district covering several hundred square miles. The upper benches have mostly long since been exhausted by the natives, who worked in a primitive way. The stream deposits are from 20 to 40 feet deep. The bedrock is overlaid by strata of gravel and sand, which are gold-bearing, but the later alluvial deposits, consisting largely of loam and decomposed organic matter, is not gold-bearing. The stream beds are prospected by boring holes to bedrock. These mines are in equatorial Africa and the climate is hot and unhealthy.

THE safe working pressure of a boiler is calculated by taking a strip 1 inch lengthwise of the shell, thus forming a ring 1 inch in width, determining the load that it will safely carry, and assuming that every other ring 1 inch wide in the shell is just like it. This may be objected to by some engineers, because a ring might be selected that will come directly through a rivet 1 inch in diameter, and it may be argued that, therefore, such a ring will not have any strength; but this does not hold good because the next ring will not be cut at all; therefore its full strength would be retained, so that taking them both together will show what the average is.

ORBICULAR DIORITE is a variety of diorite, of peculiar structure, where the minerals constituting the rock are arranged in the form of concentric rings about a central mass, or kernel, which usually consists of either the feldspar anorthite or hornblende, or a mix-

ture of both. The spheres are from 1 inch to 3 inches in diameter, a section showing alternately rings of dark and light colors. It is a rock of comparatively rare occurrence. It differs from ordinary diorite chiefly in structure, being essentially of the same composition as normal diorite. Augen gneiss differs from the diorite above described, both structurally and mineralogically. The name augen gneiss is applied to a variety of gneissoid rock in which occur crystals of feldspar having the appearance of eyes.

NO VALID MINE LOCATION can be made without a discovery. Where the underground workings of a claim determine the existence of a vein which does not appear upon the surface of adjoining ground, and it is desired to locate this ground, it is well to make the location, though at the risk of the locator, and continue the underground development of the neighboring claim, following the vein into the undeveloped ground. As soon as the workings have passed the line a valid location may be made on the unoccupied ground, but up to that time any location made would not stand as against another who might discover a vein apexing on this ground. The law does not require that a vein or deposit of payable mineral be discovered, but mineral-bearing rock in place.

MOHAWKITE, mentioned in Mining Summary April 11, is an arsenide of copper which occurs and is mined in the Mohawk copper mine, near Houghton, Mich. It is massive (no crystallization has been observed), and fine granular; the fresh surface color is gray with yellow tinge, tarnishes easily to ultimately dull purple (color, however, not a guide to its identification); brittle; hardness, approximately 3.5; specific gravity, 8.07. In closed tube gives no sublimate of arsenic, melts at cherry red, coloring glass blue (Co); on charcoal in oxidizing flame, copious fumes of As_2O_3 , odor of arsenic, finally giving a globule of metallic copper. Plattner's test for metallic arsenides shows also the presence of cobalt, nickel and a trace of iron. Composition—Cu, 61.67%; Ni, 7.03%; Co, 2.20%; Fe, trace; As, 28.85%, l. e., (Cu, Ni, Co) $_3$ As. Mohawkite is dissolved by nitric acid, but not by hydrochloric.

AS BETWEEN BLAST FURNACES and reverberatory furnaces the blast furnace has been recommended in the case of highly ferruginous ores, or where the cost of anthracite, coke or charcoal is not much greater than that of bituminous coal, wood or any other fuel fitted for the reverberatory furnace only; also for oxidized ores, low grade native copper ores and where clean slags are a necessity. The reverberatory furnaces, on the other hand, have been similarly recommended in the following cases: With highly refractory, siliceous, aluminous, calcareous or magnesian ores; where the composition of the ore changes suddenly and greatly; where bituminous coal or wood or other reverberatory fuel is much cheaper than anthracite or coke; for smelting and immediately refining rich native copper ores; its disadvantages in yielding richer slags than the blast furnace weighing less heavily in case of rich ores.

IN a water-power plant different heads cannot be employed in one pipe line nor on the same wheel, but two or more wheels may be run on the same line of shafting under different heads by proportioning the diameters of the wheels to the respective heads. Under high heads, where regulation is required, it is often advisable to use a deflecting nozzle, which admits of a variation in power without change in pressure or volume of water used, in this manner relieving the pipe line of the shock caused by "water hammer" when the flow is suddenly checked. In a plant of this description the most economical results are obtained when the gate is wide open and the diameter of the nozzle of such size as to give the necessary power. When, from any cause, the supply of water is diminished, the size of the nozzle should be reduced to maintain a full pipe line.

THERE are no extralateral rights in Leadville, Colo.—the only district in the western United States where this condition obtains. The reason for this is found in the fact that no Lake county jury has yet been impanelled that would admit the existence of an "apex" in the mines of the district, a distinction being made between ore deposits filling fissures and fissured zones, and those resulting from metasomatic deposition in sedimentary strata, which latter are not there recognized as veins, and consequently as ore deposits without "apices." This was the customary finding in each case, and became an unwritten law, as it were, of Leadville. While these ore deposits are veins or lodes within the meaning of the law, the question was always negatived by the local juries. Decisions rendered under the existing conditions in Leadville were confirmed by the United States Supreme Court.

WHERE a vein is discovered in a shaft, by intersecting the vein on its dip, and the apex of the vein, which may be "blind"—that is, covered by a later deposit of alluvial, lava, or other material—lies outside the side lines of the locator's claim, this locator gets no extralateral right, being entitled only to that portion of the vein lying within his lines. Moreover, a junior locator who takes a claim within which the apex of the vein lies may take his extralateral right, depriving the senior locator, whose discovery was made on the dip of the vein, of all of his rights, unless the locator of the apex has made his discovery upon railroad or agricultural patented land. In

this latter event he loses his extralateral right. It has been argued that the court may construct a new apex at the point where the vein passes outside the patented land, which the senior locator may consider as his apex, and from which he is entitled to all the rights belonging to an ordinary apex locator.

WHERE the respective merits of single and double-handed drilling have been tried it has usually resulted in favor of the single-handed method, but it is not always expedient to make the test of the single-handed work where it is necessary to employ men accustomed to double-handed drilling, in competition with other double-handed drillers. Two double hammers on a drill are sometimes resorted to on hard rock, but it is doubtful if this is profitable unless the men are working on contract. In hard rock machine drills will give better satisfaction and prove more economical in the end. In counting the cost of machine drill work, in addition to labor, explosives, etc., must be figured cost of compressing air, interest on cost of compressor plant, pipe line, etc., as well as deterioration and repairs. Compressors of large capacity are more economical than small ones, if there is sufficient work to economically employ the large compressor.

METAL MINES as well as coal mines produce carbonic acid gas, though more rarely the inflammable "fire damp." In some instances the carbonic acid gas has been so abundant that the mining work has had to be abandoned. This was the case in a long drift from a deep shaft at the New Almaden, Cal., quicksilver mine. Subsequently an air-tight bulkhead was built in the drift, and pipes placed connecting an air compressor at the surface with the bulkheaded drift. The intake of the compressor was attached to the pipe leading into the mine, the carbon dioxide was drawn from the mine and by means of special machinery compressed into steel cylinders under a pressure of 1200 pounds per square inch, in which form it was sold for the carbonating liquids. The Abbott quicksilver mine in Lake county, Cal., makes a large amount of "fire gas" similar to the "fire damp" of coal mines. The occurrence of fire damp in metal mines is unusual. In the case of the Abbott mine its presence is supposed to be due to the bituminous matter in the surrounding rocks.

UP to the time of the discovery of diamonds in Brazil, the principal diamond producing region was that of southern India, which included the Golconda mines. The diamond district in Brazil is near Diamantina, in the province of Minas Geraes, where diamonds were first found in the streams, and later were traced to conglomerate beds near the summit of the mountains in which they occur. The original source of the diamonds of Brazil has not been discovered, unless the conglomerate proves to be the original matrix. The production of diamonds in Brazil at present is relatively small. The largest diamond ever reported was that known as the Excelsior, found at Jagersfontein, South Africa. It weighed 971 carats, and was 3 inches thick in its greatest diameter. Diamonds have also been found in meteoric iron. Graphite, when pure, is like diamond, pure carbon but usually contains impurities, chiefly iron and clay. Although apparently soft, graphite wears the steel saws employed to cut it, with astonishing rapidity.

APPLICATION for patent for a mining claim may be made by filing in the proper land office an application for patent, and showing compliance with all the requirements of the law, together with a plat and field notes of the claim, or claims in common, made by or under the direction of the United States Surveyor-General, showing accurately the boundary of the claim or claims, which shall be distinctly marked by monuments on the ground, and shall post a copy of such plat, together with notice of such application for patent, and shall file an affidavit of at least two persons that such notice has been duly posted as aforesaid, and shall file a copy of said notice in such land office, and shall thereupon be entitled to a patent for said land in the following manner. The Register of the Land Office, upon the filing of such application, plat and field notes, notices and affidavits, shall publish a notice that such application has been made, for the period of sixty days, in a newspaper to be by him designated as published nearest to said claim; and he shall also publish such notice in his office for the same period. The claimant, at the time of filing his application, or at any time within sixty days of publication, shall file with the Register a certificate of the United States Surveyor-General that \$500 worth of work have been expended, or improvement made upon the claim by himself or grantors, that the plat is correct, with such further description by such reference to natural objects or permanent monuments as shall identify the claim, and furnish an accurate description, to be incorporated in the patent. At the end of the sixty days' publication the claimant shall file his affidavit, showing that the plat and notice have been posted in a conspicuous place on the claim during said period of publication. If no adverse claim shall have been filed with the Register and Receiver of the Land Office at the end of sixty days' publication, it shall be assumed that the applicant is entitled to patent, upon the payment to the proper officer of \$5 per acre, and that no adverse claim exists, and thereafter no objection from third parties to the issuance of the patent shall be heard, except it shall be shown that the applicant failed to comply with the provisions of the act.

Treatment of Oxidized Silver-Lead Ores of Aspen, Colo.

Written for the MINING AND SCIENTIFIC PRESS by S. I. HALLETT, Silverton, Colo.

In the low-grade ores of Aspen, Colo., lying along the great contact that has produced so many millions of dollars, two things have been demonstrated:

First, that the unoxidized ores, as a rule, concentrate by water very excellently, some of the best work of the country having been done in this camp. The oxidized ores do not concentrate at all, saving only from 35% to 50% of their values in silver and lead.

As a general proposition, in the low-grade ores of Aspen the black ores will concentrate, the red ores will not. As there is an enormous amount of these oxidized ores, extending several miles, that are at present unavailable, I have been for some time very much interested in a method of treatment that would handle them to advantage, speaking commercially, and it seems at last as though I had found a method that, followed up in certain instances, might be of great benefit to the ores in this camp.

The tests which I enclose were all made by H. A. Guess, assayer and chemist of the Silver Lake mines, in the San Juan country, and were made with great care and from various types of ores. For his thoroughness and interest Mr. Guess is entitled to the credit, if any, of working out these results.

While it is true that these are but laboratory tests, at the same time the results on these oxidized ores are of enough importance to demonstrate that the experiments are worth carrying further.

The general proposition of these silver-lead-iron ores is to treat your raw ore with cyanide, getting that loss in silver that results from water concentration and saving it, and then concentrating the tailings from your cyanide tanks so as to save your lead with the remaining silver values.

Below are the results of the experiments in detail that would undoubtedly be of great interest to those working in Aspen on ores of this class:

MEMORANDUM OF TESTS ON ASPEN ORES.

No. 1—Lime ore from an old lead stope at bottom of shaft, first level.

No. 2—Talc ore, talc shoot, from levels two, three and four.

No. 3—Iron ore, from fourth level, north.

No. 4—Iron and spar ore, 400 feet down the incline.

Partial Analyses.	No. 1.	No. 2.	No. 3.	No. 4.
Ag.....	14.5 oz.	8.7 oz.	12.3 oz.	6.8 oz.
Au.....	...	...	...	...
Pb.....	4.0 %	5.8 %	4.8 %	2.5 %
Cu.....	0.02%	...	0.03%	0.08%
Zn.....	...	...	1.70%	...
Fe.....	6.0 %	8.5 %	15.7 %	17.8 %
Mn.....	...	...	...	7.9 %
SiO ₂	33.6 %	46.0 %	44.8 %	21.5 %
BaSO ₄.....	...	...	...	33.10%
CaO.....	26.2 %	3.4 %	2.2 %	0.50%
MgO.....	...	...	...	0.38%
S.....	0.80%	1.52%	1.64%	1.73%

NOTE—Where ... are given in the analyses it means not determined, except in the case of gold.

CYANIDE TESTS BY PERCOLATION ON THE RAW ORE.

No. 4—700 grams at 20 mesh, 700 c.c. of 0.5% KCy solution; time, 10 days. Assay of residues, 0.92 oz.; extraction, 86.5%; KCy consumption, 7 lbs. per ton. Detailed tests were not made with this ore, as it was too low grade to consider. The rate of leaching was very fair.

No. 2—710 grams at 20 mesh, 750 c.c. of 0.50% KCy solution; time, 40 hours. Residues assayed 4.3 oz.; extraction, 50.5%; KCy consumption, 6.21 lbs. per ton. Rate of leaching very slow. Detailed tests were not entered into with this, for reasons as above.

No. 1—710 grams at 20 mesh, 750 c.c. of 0.50% KCy solution, or 10 lbs. solution; plain ore, no lime added; time, 40 hours. Ore assayed 14.5 oz., residues assayed 5 oz.; extraction from residue assay, 65.4%; extraction by actual recovery from solution, 65.5%; KCy consumption, 3.4 lbs. per ton. Screenings of residues gave: 43% on 80 mesh, 6.9 oz.; 52% through 80 mesh, 3.2 oz. Screenings of original ore gave: 48% on 80 mesh, 13.3 oz.; extraction, 62.8%; 52% through 80 mesh, 10.3 oz.; extraction, 70.4%.

No. 3—710 grams at 20 mesh, 750 c.c. of 0.5% KCy, or 10 lbs. KCy solution; time, 40 hours. No lime added. Ore assayed 12.3 oz., residues assayed 5.1 oz.; extraction from residue assay, 66.7%; extraction from actual recovery from solution, 65.9%; KCy consumption, 7.4 lbs. per ton. Screenings of residues gave: 47% on 80 mesh, 6 oz.; 53% through 80 mesh, 2.2 oz. Screenings of original ore gave: 47% on 80 mesh, 15.8 oz.; extraction, 62%; 53% through 80 mesh, 8.7 oz.; extraction, 74.7%.

MIXTURE OF EQUAL WEIGHTS OF NO. 1 AND NO. 3.

Test A—710 grams at 20 mesh, 750 c.c. of 0.28% KCy, or 5.6 lbs. KCy solution. Assay value of mix-

ture, 13.4 oz. Assays and strengths at different times during the test:

At	Extraction.	KCy Consumption.
3½ hours	5.4 oz.	2.8 lbs. per ton.
9 hours	5.9 oz.	3.1 lbs. per ton.
22 hours	6.2 oz.	4.0 lbs. per ton.
31 hours	6.48 oz.	4.1 lbs. per ton.
43 hours	6.52 oz.	4.5 lbs. per ton.

Fresh 0.30% solution run on and leaching continued.

55 hours	7.70 oz.	5.1 lbs. per ton.
67 hours	8.80 oz.	5.50 lbs. per ton.

Percentage extraction 65.7%, KCy consumption 5.5 lbs.

MIXTURE OF EQUAL WEIGHTS OF NO. 1 AND NO. 3, BUT COARSE.

Test B—710 grams at 8 mesh, 750 c.c. 0.25% KCy solution, or 5 lbs. solution. Assays and strengths:

At	Extraction.	KCy Consumption.
1½ hours	2.75 oz.	2.0 lbs. per ton.
5 hours	4.05 oz.	2.3 lbs. per ton.
10 hours	4.70 oz.	2.5 lbs. per ton.
25 hours	5.20 oz.	3.2 lbs. per ton.
34 hours	5.65 oz.	3.5 lbs. per ton.
46 hours	5.95 oz.	3.8 lbs. per ton.

Fresh 0.30% solution run on and leaching continued.

60 hours	7.12 oz.	4.40 lbs. per ton.
70 hours	8.24 oz.	4.8 lbs. per ton.

Percentage extraction in 70 hours 61.5%, KCy consumption 4.8 lbs.

ANALYSIS OF THE WORKING SOLUTION FROM TEST "A" MIXTURE, TO SEE CAUSE OF CYANIDE CONSUMPTION.

The solution showed: Fe, nil; Pb, nil; Zn, 0.035%, or 0.7 lb. per ton; Cu, 0.02%, or 0.4 lb. per ton; 0.7 lb. Zn in solution consumes 2.8 lbs. KCy; 0.4 lb. Cu in solution consumes 0.3 lb. KCy; KCy consumption due to base metals, 3.6 lbs. in 67 hours.

The silver buttons recovered from the working solutions were assayed for gold and found to have 70 part of gold to 1000 of silver.

Further detailed tests are being made on No. 1 and No. 3, alone and mixed.

No. 1—500 grams ore at 20 mesh, 2½ grams lime added, 10 lbs. per ton, 750 c.c., 9.3 lbs. KCy solution. Assay value of ore 14.5 oz. Assays and strengths at different periods of leaching:

At	Extraction.	KCy Consumption.
16 hours	7.45 oz.	3.3 lbs. per ton.
26 hours	8.40 oz.	3.5 lbs. per ton.
38 hours	9.75 oz.	3.65 lbs. per ton.
56 hours	10.22 oz.	3.8 lbs. per ton.
70 hours	10.52 oz.	3.90 lbs. per ton.
83 hours	10.65 oz.	3.95 lbs. per ton.

Extraction 10.65 oz. in 88 hours, or 73.4%; KCy consumption 3.95 lbs.

NOTE.—This has not yet been checked by residue assays, but will be.

MIXTURE OF NO. 1 AND NO. 3, EQUAL PROPORTIONS.

500 grams at 8–10 mesh, 2½ grams lime added, 10 lbs. per ton, 750 c.c., 9.8 lbs. KCy solution. Assay value of the mixture, 13.4 Ag. Assays and strengths at different periods of leaching:

At	Extraction.	KCy Consumption.
13 hours	7.15 oz.	3.65 lbs. per ton.
22 hours	7.63 oz.	3.75 lbs. per ton.
34 hours	7.87 oz.	3.80 lbs. per ton.
44 hours	8.12 oz.	3.85 lbs. per ton.
66 hours	8.65 oz.	3.95 lbs. per ton.
84 hours	9.30 oz.	4.15 lbs. per ton.
96 hours	9.66 oz.	4.25 lbs. per ton.
112 hours	10.00 oz.	4.35 lbs. per ton.

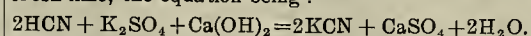
Extraction 10 oz. in 112 hours, or 74.6%; KCy consumption 4.35 lbs. per ton.

NOTE.—This has not yet been checked by residue assays, but will be.

The zinc method, as for gold, would, judging from results on gold cyaniding, consume about 1 lb. zinc shavings per oz. of bullion recovered. This in the case of silver would mean about 9c per oz. of silver recovered for zinc cost, which would be simply prohibitive.

Various schemes were tried to recover this Ag direct, and a method has been tried on a laboratory scale which promises well. It was found that by simply acidifying the dilute alkaline cyanide solution its Ag contents were completely precipitated as Ag cyanide (AgCN). Numerous tests were made to see the completeness of this precipitation, and the amount of acid necessary, and it was found to be never less than 99% of the total Ag content, and that for a 4-lb. KCy working solution it took 4 lbs. sulphuric acid, or say 1 lb. to each 1 lb. solution per ton of solution.

The silver cyanide, being granular, can easily be filtered off, and the clear acid solution containing the cyanide as HCN, and the potassium as K₂SO₄, can be reconverted to KCN by running through a bed of fresh lime, the equation being:



The calcium sulphate thus formed, being only slightly soluble in the solution, would drop out to a large extent as a granular precipitate, and would give no trouble. Several careful tests were made on measured quantities of cyanide silver-bearing solutions of known strength, going through the process

of precipitation of the Ag, and neutralization of the filtrate, and the resultant neutralized cyanide solution was found to have lost none of its free cyanide in the operations.

The silver cyanide, precipitated pure, has a little over 70% metallic silver, and with a solution similar to the one analyzed, with 0.6 lb. Zn and 0.4 lb. Cu per ton of solution, these cyanides being also precipitated, would give a precipitate carrying about 30% Ag, 20% Zn and 10% Cu, metallic.

Tests have not been tried as yet, but it is probable that this precipitate could be reduced to the metals by simple fusion. This will be tried.

Concentration tests will be tried on the residues, to see what saving can be effected on the lead contents, as well as the silver remaining, particularly in the coarse sizes.

CHECKINGS OF EXTRACTIONS GIVEN IN TESTS.

No. 1.

Assay of residue at 88 hours.....	3.25 oz.
Extraction by difference.....	11.25 oz. = 77.6%
Extraction by assay of solution.....	10.65 oz. = 73.4%

No. 1 and No. 3, mixture.

Assay of residue at 112 hours.....	3.15 oz.
Extraction by difference.....	10.25 oz. = 76.5%
Extraction by assay of solution.....	10.00 oz. = 73.4%

MEMORANDUM OF CONCENTRATION TEST ON CYANIDE RESIDUES.

	Ag.	Pb.	Fe.	Insol.
	Oz.	%	%	Res.
Residues, weight 4.5 lbs. ...	3.85	3.60	...	...
Concentrates recov'd, 9 lbs	9.00	9.20	9.80	57.60

Extraction, gross.....47.00% 51.1 %

Tailings assay.....2.55 2.10

Ratio ore : conc. : : 5 : 1.

These residues representing, approximately, 30% of the Ag and all of the Pb originally present in the ore, the gross extraction by concentration, based on original ore, would, therefore, be 14.1% Ag and 51.1% Pb, bringing the Ag extraction up to about 84% by cyaniding and concentration of the residues.

The amount run being so small, it was impossible to make a high-grade lead concentrate, and still make it a fair test for extraction.

Removing Obstructions from Drilled Wells.

To remove a fast bucket from a drilled well, knowing the inside diameter of the bucket, take a piece of

square iron that will fit the bucket tightly. Taper the iron so it will easily enter the bucket, and with a chisel cut barbs in each of the four corners. When the iron is driven into the bucket the barbs will catch, and, unless it be stuck very fast, the bucket can be drawn up.

For removing pipe, take a piece of casing about 3 feet long, rivet a piece of heavy wagon tire to each side of pipe, 3½ feet long, and bring this together at the top, fastening to a smaller pipe, to which the rope is to be fastened. By driving this down over the pipe, the latter will wedge between the side irons, and in this way the pipe can be removed. (See sketch.)

If this fails, take an old car spring or any good spring steel that is large enough to make two jars sharp on the end. Rivet these on the inside of the casing at the bottom, so that the jaws reach up inside the casing and come nearly together. When forced over the pipe the jaws will catch, and the pipe can be easily removed.

Care of Hoisting Ropes.

The proper treatment of wire ropes is as essential to their lives as that they should be of good quality and manufacture, says a writer in the West Australia Engineering Journal. When being put to work they should be put on a turntable from the outside end only, and kept tight between the turntable and drum so as to prevent injurious kinking. Overlapping on the drums should be avoided. A few feet should be cut off the cage end of shaft ropes about every four or six months. Ropes should never be worked above their proper working load—viz., one-tenth the breaking strain on the vertical, and one-seventh the breaking strain on inclines. In shafts the weight of the rope from the pulley is included in the working load. Sudden jars or jerks should invariably be avoided. All grooves of drums or pulleys, etc., should be made to fit the rope. V-shaped grooves should on no account be used. Side friction of ropes caused by their being coiled upon drums or upon themselves should be minimized as far as possible. Wire ropes should always be stored in a dry place, and if put upon the ground should have some intermediate source of protection. It should be remembered that in salt water, or under the influence of saline moisture, steel stretches. It corrodes quicker than iron. Bright steel corrodes more rapidly than varnished or dull wire. When affected by saline moisture corrosion may be accelerated by iron wire cores in steel ropes.

Copper Deposits of the Sierra Oscura, New Mexico.*

By H. W. TURNER, San Francisco, Cal.

Lying to the east of the Rio Grande, in central New Mexico, is a long N.-S. mountain range, broken into separate ridges at several points. These have received separate names; the mountains at the south end, near El Paso, being known as the Franklin mountains, and then, following successively, to the north, the San Andreas range, Sierra Oscura, Manzano and Sandia mountains.

At the eastern base of the Sierra Oscura are several low ridges, remarkable for their red color. All of these red ridges contain reefs of copper ore. The eastern flanks of the Sierra Oscura are composed of limestone. Some fossils in the limestone were examined by J. P. Smith of Stanford University, Cal., who says they are Fusulina and indicate Upper Carboniferous age. The sandstones and shales containing the copper reefs directly overlie the limestone, and are very likely of Permian age, like the similar beds in Texas.

Overlying the copper beds are red sandstones and shales in which very little copper has been found. The cupriferous zone and the red sandstones and shales are everywhere associated, and as one stands on a high point, he will see that these rocks form three main belts or lines of hills. These may be referred to as the northern, middle and southern belts.

The northern belt was not visited by me, but is known to contain copper deposits.

The middle belt has a trend of N. of W. The copper reefs have been traced for a distance of more than 2 miles.

The southern belt has a trend of about N. 30° W. The copper reefs in this belt have been traced for more than 4 miles. There are at least three distinct reefs in the southern belt which carry copper ore. These reefs dip with the enclosing sediments, similar to coal beds, so that they can be followed with great regularity for a long distance. Two of the reefs consist of sandstone containing copper glance (chalcocite) and copper carbonate in minute grains disseminated through the rock and in seams. The third reef is composed chiefly of shale, and is 2 to 3 feet in thickness, the whole of which is impregnated with minute grains of glance and carbonate. The exploitation of the region is still so incomplete that no reliable estimate as to amount of ore available for treatment can be made. None of the reefs have been exploited in depth.

Fissure veins have not been found on the north end of the belt, but along certain fault fissures of the southern part of the belt there are deposits of chalcocopyrite.

In addition to the glance, carbonate and chalcocopyrite, hornite occurs in the center of nodules which have a diameter of from 1 to 2 inches. Such nodules are abundant in shale at the north end of the southern belt. Impressions of leaves may be noted in some of the sandstone, and the copper ore has in part replaced plant stems and wood, the texture of which is still preserved.

The more massive sandstone is arkose, i. e., composed of the detritus of granitic rocks. It contains rolled grains of iron oxide (in part magnetic) up to 1/4 inch in diameter. This arkose is plainly derived from an underlying granitic area not now exposed, and it is equally clear that this granitic area contained deposits of iron ore from which the rolled grains were derived. The sandstones rich in iron do not contain any appreciable amount of copper, and the copper reefs are not rich in iron.

Two partial analyses, from carload lots shipped to the smelter, are given below:

	No. 1.	No. 2
Silica, per cent.....	65.0	65.5
Gold.....	trace	trace
Silver, troy ounces per ton.....	0.9	1.2
Iron, per cent.....	1.8	5.2
Copper, per cent.....	10.5	9.9

The shipments to the smelter were, of course, of selected ore. The average copper content of the reefs, as determined from a series of assays made by the Selby Lead & Smelting Co. of San Francisco, is about 4%.

The copper-bearing reefs can best be seen in the southern belt, because more work has been done there. At least two of these reefs, the middle and the lower, are large enough to be worked (being from 1 to 3 feet in thickness). Future exploitation may show that they exceed this thickness at many points. One deposit in the middle belt has a thickness of 7 feet. If the copper deposits of the Sierra Oscura district were in the form of fissure veins, no reliable estimate of the quantity of ore could be made without a vast amount of development work; but inasmuch as they are in the form of reefs regularly imbedded in the sandstones, an approximate calculation can be made after the beds have been followed down at a few points. All of the reefs taken together will very likely average 3 feet in thickness over many miles in horizontal extent.

No dikes or igneous rocks of any kind have thus

far been found associated with the copper reefs or the enclosing beds. They do not occupy lines of faulting, and, indeed, were certainly formed before the main faults of the district, which have caused the copper-bearing sediments to be displaced into the three belts or lines of hills above described. Small faults have caused minor displacements of the reefs at a few points. The mode of occurrence of the copper ore in regular beds, in part replacing plant remains, suggests that, like bog iron ore, the copper was deposited from the waters which deposited the enclosing sediments.

The extensive surface showing has induced considerable prospecting, and a large number of claims have been located. The climate is good, there being rains in July and August to temper the summer heat, and in the winter time the precipitation is small and the temperature not low.

The nearest railway station is Oscurito, on the El Paso-Rock Island route, about 16 miles to the east, with nearly level land from the station to the mines. There is a store and postoffice at Estey City. At Capitan, 35 miles from Oscurito, there are coal mines containing a good quality of coal, the price of which, delivered at Oscurito in single carload lots, is \$5.50 per ton. There is said to be undeveloped coal near the station, and the Estey Mining & Milling Co. has opened up a 14-inch vein to the south of Estey City. At Alamogordo, on the railroad, 22 miles south of Oscurito, there are two sawmills, supplying cheap lumber.

At Estey City an electrolytic plant has been built for treating 100 tons, or more, of copper ore per day. Having no recent information regarding this plant, I am unable to state what success they have had.

The copper carbonate is not in sufficient amount to be treated by itself by leaching, and the glance ore would require roasting with pyrite or chemicals before being amenable to a leaching process. It is probably not a good concentrating ore, as the soft glance would slime. At the time of my visit no large bodies of pyrite or chalcocopyrite were known in the immediate vicinity. The ore could, of course, be reduced in a smelter. Water is available only in wells. The Sierra Oscura is covered with nut pine.

Gold in Brazil.

The gold fields of Calcoene, Brazil, are situated near the headwaters of the Cassipore river, in the territory formerly claimed both by Brazil and French Guiana, but now belonging definitely to Brazil, and forming a part of the province of Sara. The gold region lies about 70 miles in the interior, and communication with the coast is made by a single-rail mule tramway of special design and belonging to a French company, which also owns a license to mine over the best parts of the territory.

The gold-bearing region extends over a territory of about 150 square kilometers, but it is very likely that some other areas, more or less auriferous, will yet be discovered. The first activity in Calcoene occurred in 1893-1894. Over 6000 men came and built their palm cahins and started work along the streams. They were nearly all negroes from the Guianas, with a few Portuguese, Brazilians and Americans. The period of large output lasted about four years, but it fell off suddenly. The population lessened by degrees, and nowadays only fifty to seventy negroes remain there, working in small parties of four or five.

The geology of the gold-bearing region is little known. As is often the case in tropical countries, the country rock is decomposed to a great depth by reason of weathering. Granites and quartzites abound. Diorite is also reported to exist.

In the decomposed rock at the surface there are numerous boulders of hematite and small deposits of pyrolusite (manganese oxide). Big dikes of pegmatite are often found along the beds of the gold-bearing streams.

The deposits are shallow placers of recent formation. They are limited to the actual beds of the streams, no bench gravel having ever been found. The gold-bearing ground appears to be limited to the heads of the several creeks which unite to form the Cassipore river; as they are confined to deep valleys between the hills, they are narrow and the gravel is very limited in extent, except in certain places down stream, where are found large swamps, not so rich as the upper parts, but covering a wide area.

Most of the creeks have been worked over a good many times since 1893. They have paid well, but the occurrence of gold has been irregular.

Among the most interesting of recent processes are the concentration and segregation of sulphide ores by means of the electro-magnetic separator; a similar result accomplished by means of crude petroleum; and at Broken Hill, N. S. W., the separation of zincblende from complex ores by means of a heavy salt solution. The latter is still in the experimental stage, but the separation has been reported as satisfactorily accomplished in the laboratory, where most new processes have their origin.

The Mines of Tonopah.*

Written for the MINING AND SCIENTIFIC PRESS by
WALTER OSBORN.

Tonopah is a mining camp that is attracting much attention at present. It is now entering upon an interesting period of its development.

Of its early history so much has been said that it is unnecessary to add more here. After the leasers had demonstrated the richness of the Mizpah and Valley View lodes, numerous companies were formed to develop the adjacent ground and determine the extent of the mineral belt.

As these companies had no surface indications to work on, but had to sink "blind," taking chances of finding pay ore, the progress of their development has been watched with interest by those interested in the camp's future.

The companies have been sinking day and night for months, and their shafts are now down hundreds of feet.

It has required great faith and courage to go down in this unknown territory.

During the past few weeks rich strikes have been reported in rapid succession in different mines, most of them in shafts hundreds of feet deep and far apart.

Every strike extends the known area of the mineralized zone and no one can say at this time how great its extent is.

Thus far every one who has sunk through the blue porphyry that caps the greater part of the district has encountered the pink porphyry and there found ore.

The most encouraging part of these discoveries is that in nearly all cases where ore has been found it is high grade, and the ore body is large.

The Tonopah Mining Co. has, it is estimated, several millions of dollars' worth of ore in sight and have found some of their richest ore at the lowest levels. They are down 800 feet.

A noticeable thing about the ledges in Tonopah is their size and richness combined. Many camps have large bodies of low-grade ore and others small veins of high-grade ore. But Tonopah has ledges of rich ore. The Mizpah has ledges 10 feet wide that will average over \$100 per ton.

The Montana-Tonopah has a 5-foot ledge that will average several hundred dollars per ton, and the latest strike in the Belmont-Tonopah has uncovered a large ledge in which values occasionally run into the thousands.

When one considers that comparatively little development work has been done outside of the Tonopah Co., except in a few deep shafts and short drifts, and that this limited development has given such fruitful results, future developments are looked forward to with much interest.

The writer considers the recent strike made in the King-Tonopah as important in extending the mineral belt.

The King-Tonopah is owned by the O'Meara-Lynch Co. and is located 1 1/2 mile north of Tonopah, and outside of the previously proven belt.

The discovery of ore made in the King-Tonopah shows the mineral belt to be much greater in extent than was generally supposed.

The West End struck a large ledge a short time ago which exhibits a remarkable phenomena. The ledge contains numerous fissures which are filled with gas, which, apparently under pressure, rapidly exhausts itself when one of these fissures is tapped.

In the past Tonopah has existed under the usual disadvantages of new camps in the Great Basin region, but these are rapidly being overcome. There is now plenty of water, and a railroad is soon to be built to the camp, which will lower the cost of fuel and all supplies.

The camp badly needed a reduction works to treat the low-grade ore, as there are thousands of tons of ore, worth from \$20 to \$50 per ton, that would have to be treated in the district to become profitable.

The writer solved this problem by erecting a custom mill at the wells.

The plant is known as the Nevada Milling & Reduction Works, and consists of a Kinkead mill and cyanide plant. It is already producing bullion and is at present being enlarged and adding concentrators.

Another mill will be in operation in a few months.

The ore is practically free from base metals, except manganese and iron, and mills readily. It is of much the same nature as the Comstock ore, and rich ore from the Con. Virginia of the Comstock and the Montana-Tonopah, placed side by side, look so much alike it is almost impossible to tell them apart.

The discoveries in Tonopah have resulted in other finds immediately around it. Ray, Gold Mountain and Lone Mountain are the centers of outside activity and valuable discoveries are reported from there. One little mine at Alpine, Lone Mountain, only a few months old, is netting its owners \$20,000 per month, and there are numerous other mines that have rich ore ready to ship.

Tonopah means much for Nevada. It is attracting capital and men of energy, and the State is entering upon a new era of prosperity. Nevada to-day spells "opportunity" perhaps to a greater extent than any other State in the Union.

* See Illustrations on front page.

*Trans. Am. Inst. Min. Eng. (condensed).

The Late Irving M. Scott.

A great man died last Tuesday—Irring M. Scott—"the man who built the Oregon." True, other men had aided in building that vessel, but since Santiago and the world's realization of what was done there, Scott's fame filled the earth. But the building of the Oregon, or his part in it, was but an incident in his career. He did greater work in what aid he

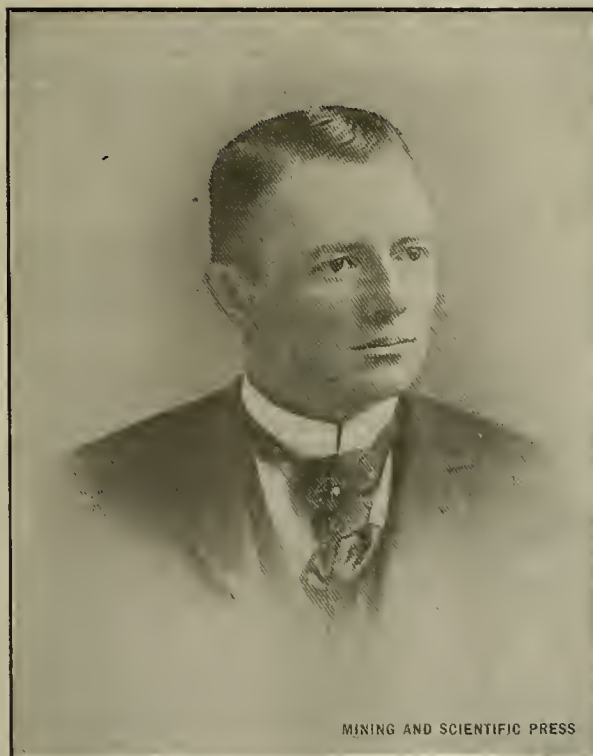


The Late Irving M. Scott.

gave to the building of the commonwealth of California, to the advancement of man's dominance, to the uplifting and upbuilding of the material interests of the Pacific coast. And even were there space to tell of all he did in advancing those material interests as much more would have to be told of his aid to art and artistic advance, of his cultivation of literature and the finer arts that adorn life. A great man has gone and gone gladly, for he felt his work was done. In conversation with the writer ten days ago he said: "Superfluous lays the veteran on the stage. It is a mistake—this idea of long life. A man should not desire to live when he feels and knows his work is done." Eulogy or notice of his life is unneeded. He is past all praise or need of praise. Simple as all great men are he lived a life of usefulness and made the world better for having lived in it.

Death of Victor M. Clement.

Victor M. Clement, a distinguished mining engineer



The Late Victor M. Clement.

of California, died on April 26 at Saltillo, Coahuila, Mexico. He was born in Los Angeles, Cal., in 1855, and was educated in the public schools of that city,

subsequently graduating from Santa Clara College in 1876, and then took the mining engineering course at the University of California. His first practical mining experience was gained in Mexico, subsequent to which he became superintendent of the Empire mine at Grass Valley, Cal. Later he assumed charge of the Bunker Hill & Sullivan mine, in the Coeur d'Alenes, Idaho, which responsible position he resigned to join John Hays Hammond in South Africa. There he became one of the leading figures in mining and political circles. At Johannesburg he was assistant consulting engineer of the Simmer and Jack properties. Immediately after the Jameson raid Clement was one of a number of Americans and Englishmen who were imprisoned by the Boer Government for active partisanship, the leaders being charged with high treason. The friends of the Americans whose lives were thus imperiled, upon receipt of the news by cable, immediately set about securing their relief, and strong political influence at Washington was brought to bear upon the Transvaal Government. Hammond and several Englishmen were condemned to death, and Clement, with fifty others, was sentenced to life imprisonment. Efforts in their behalf were redoubled, with the result that Clement and his associates were freed upon the payment of heavy fines, when all left the Transvaal.

Returning to America, Clement became associated with the Rothschilds, and more recently with the Guggenheims, in extensive mining operations. He accumulated a large amount of money, and was in Mexico looking after his personal interests when death overtook him. In the death of Victor M. Clement there is removed from the active field of the mining world one of its brightest lights. He was a serious, earnest man, and one true to his friends. His loss will be mourned by a large circle of friends and acquaintances in America and abroad.

Factor of Safety for Winding Ropes.*

By H. C. BEHR, Con. M. E., Johannesburg, S. A.

The Transvaal Government regulations specified that the rope used for hoisting men should have permanently a breaking strength of six times the load, meaning, as I interpret the wording, that when the cross-section is reduced through wear or corrosion the rope must still have the above margin of strength. This is also, I believe, the sense of the Prussian State mining law bearing on this point. Neither law seemed to fix any initial factor of safety.

It would hardly seem practicable to provide one general factor of safety for initial strength of rope, since the conditions under which ropes work are so varied. A rope in a vertical shaft running over large sheaves and drums, especially if winding on the latter in grooves in a single layer, is subjected to very little wear; while one working in an incline shaft wears generally very rapidly. Such wear is very much less with ropes made of the harder wires which have come into use more recently. Crucible steel wires are softer and wear out more rapidly. The hardest plow-steel wires have a very high ultimate strength, and it might, therefore, seem at first that by the use of such material a higher factor of safety would not increase the weight of ropes. Wire of such hardness is, however, brittle, and would, therefore, give less security with a higher factor of safety than the plow steel of less ultimate strength and hardness at present in use.

Where the water in a mine is acid, corrosion will naturally act more quickly, and the rope in such mines should therefore have a somewhat higher factor of safety; or, what is better, the ropes should be more frequently changed. The latter would seem to be better, both from a standpoint of security and also for economic reasons, especially in deep shafts, where the extra weight of rope would require heavier machinery. It ought to be remembered, also, that wear is about proportional to the number of trips made by the rope, independent of the time, while corrosion is probably proportional to the time independent of the work done. Ropes winding in a single layer on a grooved drum wear much less than those wound on in several courses. In the latter case, also, the rope is subject to shock when it arrives at the drum flange and has to mount suddenly on top of the course just completed.

As an example of life of rope may be quoted that given by Reuleaux—a record of the 3900 feet deep shafts at the mines at Příbram, in Bohemia. These ropes were made of crucible steel, and were proportional for an initial factor of safety of 7, based on the aggregate strength of the wires, without any percentage reduction for twist or unequal strain. The above ropes made each 100,000 trips per year, and lasted, according to the author-

ity quoted, from three to four years. They were

*Communication to Chief Inspector of Mines for the Transvaal (condensed).

wound on the drum in two layers. The data from some English mines show factors of safety in one case as low as 5 and two of 5½. My informant took these data while in England recently, and states these ropes are used for hoisting men.

In view of the small influence of the factor of safety on the size of plant in winding from moderate depths, it has been urged by advocates of extremely high factors of safety that stage winding should be resorted to in order to limit the length of rope and enable the use of a high factor of safety, with the idea that then it would not much influence the size and cost of plant.

This last deduction is, however, an error, because underground hoists of large size can not generally be run by steam direct, but require to be operated through some means of power transmission like electricity or compressed air, both of which require expensive power-generating plant at the surface and costly pipe, or electric conductors to the machinery underground, so that the cost of the entire winding plant would certainly be at least doubled, especially when we consider that the cost of a large underground hoist itself alone is greater than one of equal capacity at the surface, owing to the large excavations and the necessity of making the machinery in pieces small enough and light enough to be got down through the shaft compartments. As to the two systems of transmission that might be used, it may be said that electric hoists of a large size, like those that would be required in most mines on the Rand, have not yet been demonstrated to be a complete success, and transmission by compressed air, which otherwise would afford a very manageable power, is costly to operate.

When winding in two stages is adopted, as it probably will have to be for very deep shafts, the cheapest system would, no doubt, be to lead the ropes from the second stage up to a winder at the surface. This system has been largely and successfully used for hauling along inclines starting from the foot of a vertical shaft. It has, therefore, undergone the test of actual working. For vertical shafts it has been recommended by Harbak as far back as 1878, and again brought forward at the Paris Mineral Congress of 1900. This system is suitable for only two stages, but it will be a long time before more than this will be needed. It is evident that this system will require for the lower stage ropes of a length equal to those that would be required were the winding done in one lift from the full depth, so that this useful system of deep winding would be very unfavorably affected by a high factor of safety in the rope.

Many existing plants on the Rand would also be disadvantageously affected by a higher factor of safety. There are shafts now nearly 4000 feet deep and machinery installed or purchased for winding from 4000 feet to 5000 feet depth in one lift. It would be great hardship on such mines were they forced to get heavier machinery to operate in one lift or to install additional winders so as to operate in stages. If these mines retained the use of the plants they have with a higher factor of safety, many of them would have to reduce their output, thus increasing the cost per ton of ore. If the weight of ropes were increased most of such winders would be operating more out of balance, and the negative moment which many of them have near the end of the trip would be increased. Such a negative moment is always dangerous, since it acts with the energy stored in the moving masses to keep the engines in motion, and makes it more difficult to stop them. Overwinding would, therefore, more easily occur. The greater tension in the coils of rope wound on the drum, due to the extra weight of rope, might increase the crushing strain on the metal of the drum shell, in some cases to a dangerous extent.

Inspection as to wear and internal corrosion should be frequently made. The reduction in cross-section of a rope by wear of the outer wires could perhaps be approximately estimated from measurements of the circumference of the rope compared with measurements made of the same rope before worn and after it had run for a sufficient period to bring the strands close together. It might be possible, also, to devise some means for measuring the individual wires, and thus arrive at an approximation to the cross-section. If the cross-section thus obtained should give a factor of safety less than the minimum allowed by law, the ropes should be condemned. If a single wire breaks in a rope, the total strength is only reduced very little, particularly if the rope is composed of a large number of wires. If more wires are broken, then, unless the breaks are near the same point of the rope, the strength will be reduced only in proportion to that of a single wire, because of the splicing effect for the distance which generally exists between breaks. The breaking of wires is, however, an indication of brittleness, and a rope with broken outside wires should, in the writer's opinion, be condemned.

In inclines the lower end of the rope receives the principal wear, because in descending it has to start the carry rollers into motion by friction, during which period it experiences considerable wear by sliding over the rollers. The lower 100 or 200 feet should, therefore, be periodically cut off.

A rope showing appreciable internal corrosion should be condemned. The necessary inspection for this could probably be made without injury to the

rope by a moderate untwisting of the strands at points where corrosion is suspected.

Some English and German manufacturers often recommend a very high initial factor of safety of 9 or 10 where the rope is required to last a long time. Such recommendation is often made with a view to selling a heavier and more expensive rope, and, at the same time, securing for it a long life, which fact can later be referred to for advertising purposes. For flat ropes the initial factor of safety generally used is 8 or 9, because such ropes are liable to much more unequal strain than round ones.

In view of the foregoing observations, I believe that a minimum factor of safety of 6 would be ample under any conditions for round rope, but that the length of time which the rope is allowed to be used should be decided by taking account of the conditions under which the rope operates, aided by frequent careful inspection. The cost of a rope is a comparatively small item in the general expense account of a mine. A more frequent change of a less weight of rope would also probably not cost more than that of a heavier rope, together with the extra winding cost due to its use. It is also to be considered that the management of the mines is in all cases in favor of safety rather than of long life of rope.

I would suggest, therefore, that the present minimum factor of safety be retained, but that the law be, perhaps, a little more definitely worded to make more clear the point that the ultimate strength of the rope must never during its employment in winding men be lower than six times the strain upon it. The initial factor of safety could be chosen with reference to the time that the rope may be allowed to work or the number of trips that it is permitted to make, due consideration being given to the conditions under which the rope works as to wear and corrosion.

Those ropes used for ore winding should be permitted to be employed in handling a few men whose aggregate weight is much less than the load of rock hoisted. It is often necessary to do this for shaft inspection, repairs or similar purposes.

The Elmore Process.

Written for the MINING AND SCIENTIFIC PRESS.

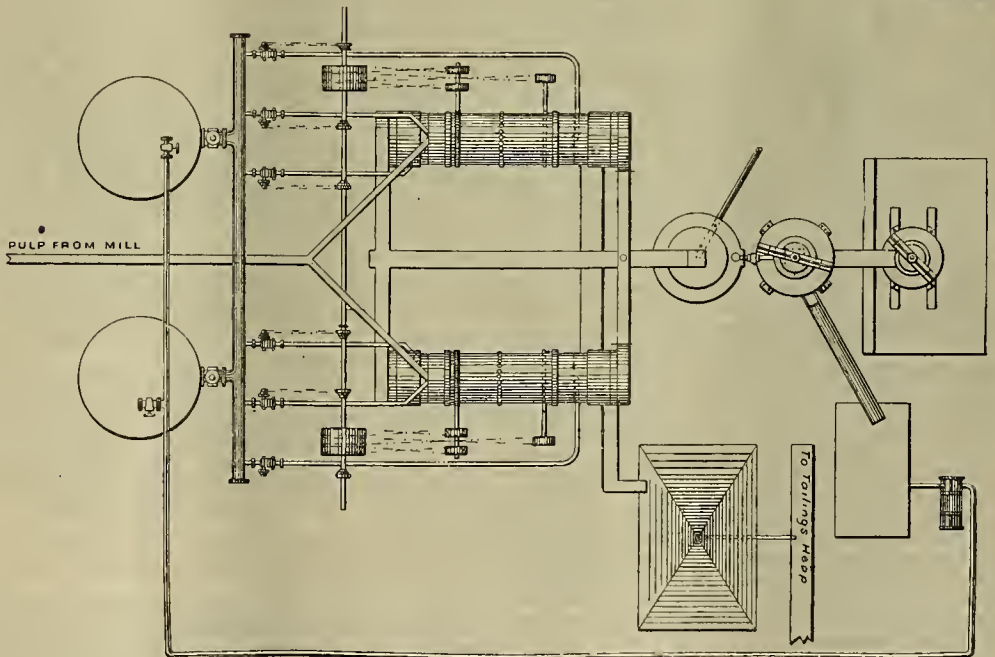
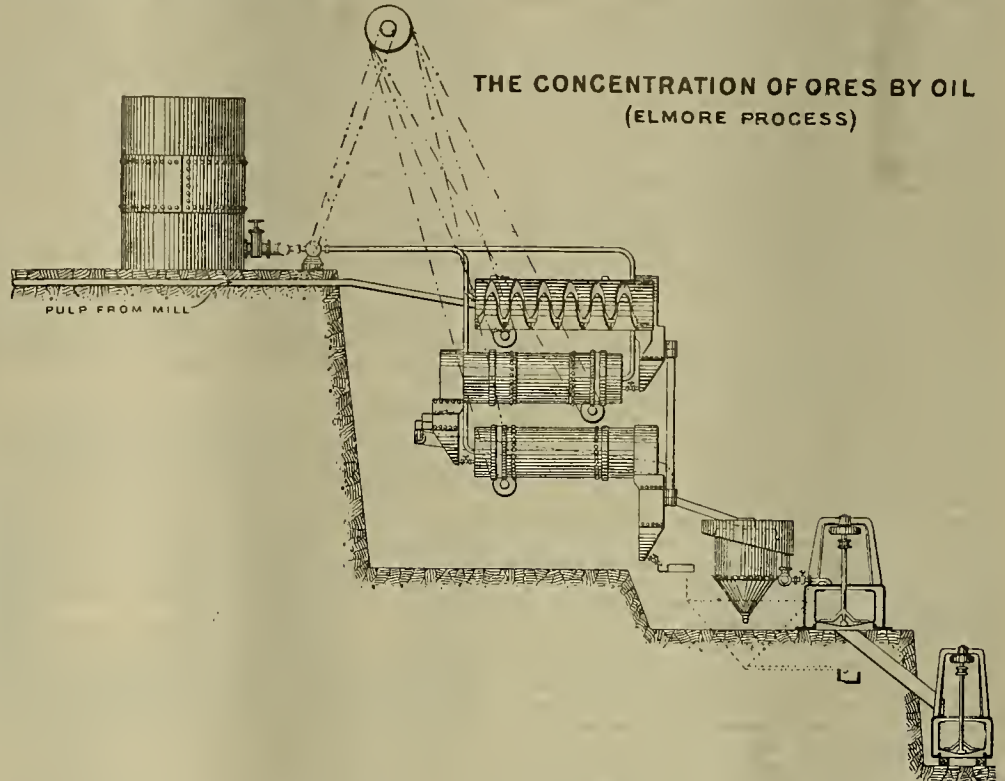
The successful and economical concentration of low-grade ores is always a subject of interest and importance to mine owners and operators. There are many mechanical devices in use to effect a separation of poor or worthless material from the high-grade ore, usually sulphide, associated with it in small amount. As a whole, the ore is often too low in value to afford a profit after paying expenses for mining and metallurgical treatment, and for this reason concentration is resorted to. The Elmore process is a novel and ingenious method of accomplishing the concentration of ores of this class. Reference has previously been made to this process in the MINING AND SCIENTIFIC PRESS, but no detailed statement of the method employed has been given. The plant consists of three hollow horizontally disposed cylinders of galvanized iron, 10 feet 6 inches in length and 3 feet diameter, the ends being closed excepting a central opening in each head. These cylinders are arranged one above another, vertically. Each cylinder is a counterpart of the others. Within each cylinder is a spiral diaphragm extending throughout its length. At each 90° of the circle is fixed a partition, or baffle plate. The ore, crushed wet to 30 mesh, is introduced from the crushing mill launder to one end of the machine together with the water and a quantity of crude petroleum residuum. The cylinders being mounted on carriers are driven by gearing, revolving about six times a minute. The spiral diaphragm acts as a conveyor and pushes the pulp and oil toward the opposite end of the cylinder. Its progress is broken by the baffle plates and the pulp and oil fall by gravity into the next compartment, which repeatedly occurs until the end of the cylinder is reached, when the pulp and oil have become thoroughly mixed. At the discharge end the cylinder projects into a hood which surrounds it, the lower portion being cone-shaped and filled to near the top with water. The mixed pulp and oil pours from the end of the upper cylinder into the cone-shaped hopper. The oil rises to the surface, when, curiously, it is found that the oil has taken up the metallic sulphides while seeming to have no affinity for the gangue minerals. The small particles of sulphide are enveloped within the oil. This flows automatically away and is delivered by a pipe to a large hopper situated below the lowest cylinder of the series. As may be anticipated, a complete separation of mineral is not effected in the first cylinder. The water and pulp, relieved of a portion of the sulphides, pass out of the bottom of the first cone, together with some oil, and this goes into the end of the second cylinder with additional oil, where the process of the first cylinder is repeated with a further separation of sulphides. The flow of pulp from the bottom of the cone is regulated by a valve, which maintains the proper water level. In some cases the separation is found sufficiently complete after

passing the second cylinder, in which case the power is cut off from the third cylinder and the expense slightly reduced, otherwise after passing the second cylinder the pulp, with added oil, goes through the third cylinder. The accompanying sketches show the disposition of the cylinders and separators, the location of oil tank, etc. Water, steam or electric power may be employed.

All of the sulphides separated from the pulp, and collected as above described in a single receptacle, is charged in given amount to the first separator. This is a horizontal cylindrical pan, around the upper edge of which is an inwardly projecting flange. The bottom is flat with a discharge opening covered by a cone-shaped door about the center, free to move up and down on the spindle about which the pan re-

When the amount of mineral has accumulated in the pan to a sufficient extent the machine is stopped, while the cylinders may continue to discharge into the settling tank, making the process practically continuous. The discharge door of the pan is raised and the oil and contained sulphide are washed out by means of hot water under pressure with a hose, requiring only a few minutes, when the machine is again started.

The next step is the removal of the sulphide mineral from the small amount of oil remaining and the separate recovery of both. Upon passing from the separator the oil and mineral runs to a hopper beneath the pan from which it is sent by a spiral conveyor to a second separator. This latter is similar to the upper separator, but has perforated sides, be-



Elmore Process; Plan of Plant.

volves. Hot water is first introduced to the pan when running at 1000 revolutions per minute, the centrifugal force causing the water to rise in a vertical column, which reaches from the bottom to the top and extending entirely around the circumference of the pan, being prevented from discharging over the rim by the inwardly projecting flange previously mentioned. The oil containing the mineral is then permitted to run into the pan, coming from a settling tank intermediate between the pan and the revolving cylinders, and in which any water coming over with the oil is separated. Immediately the mineral strikes the bottom of the pan the centrifugal force throws the mineral through the vertical column of water to the sides of the pan, the oil forming an inner ring against the wall of water, gradually extending to the top and flowing over the edge of the flange, and being conducted to a tank beneath the pan. An outer casing prevents the splash and waste of the oil.

ing encircled with a fine screen—100-mesh—and provided with a cover. It is operated in the same manner as the other and revolves at high speed, the centrifugal force driving the oil and hot water through the screen. This is accelerated by the introduction of hot air, which thins the viscous oil. The sulphides which are retained on the screen are removed in the same manner as from the upper separator, and being practically free from oil and moisture are ready for shipment to the smelter.

At St. Davids mine, North Wales, England, where the process has been in operation several months, the concentrates obtained by this process from tailings containing 3% copper run 8% to 10% copper, and final tailings run as low as .05% copper.

Although sulphides only are mentioned as treated by the Elmore process, free gold, copper and other native metals can be recovered in the same manner. A fifty-ton plant is to be erected at Le Roi No. 2 mine Rossland, B. C.

Milling at the Camp Bird, Colo.*

NUMBER IV.—CONCLUDED.

By THOMAS H. WOODS and GODFREY D. DOVETON.

COMPARISON OF SINGLE AND DOUBLE TREATMENT.—Referring to the grading tests, we see that the material settled in the 300-ton vat has a greater fineness than that settled in the 200-ton vats, and also slightly finer than the material caught in filling two of the 24-foot vats at once. To this fact may partially be attributed the increased extraction in the single treatment. A comparison of the results obtained on a large number of vat charges indicates that an increase of 15% is found in the quantity of leachable material deposited in a given time, and an increase of 5% in the gold extraction in 20% longer time.

At the same time there is a decrease in the labor cost of 9 cents per ton, and in the cyanide consumption of 10 cents per ton; and, taking into consideration the increase in cost of constructing a plant for double treatment, the advantages of single treatment on these tailings are so obvious that further argument would be superfluous.

The tailings are discharged by sluicing throughout the year. A pressure-pump is used in winter, however, to pump the slimy water from the dam to the hose line. With a 3-inch hose, 1½-inch nozzle, and a pressure of sixty pounds, one man can discharge 100 tons and clean the filter bottom in two hours. Bottom discharge doors are used.

THE PRECIPITATION OF THE BULLION.—The zinc used in the precipitating boxes is received in sheets, 7 feet long and 18 inches wide, costing 7.66 cents per pound, and are cut in the machine shop to a thickness of $\frac{1}{16}$ inch. A Hampton lathe is used, and, winding five or six sheets on the mandrel at once, a man can cut 140 pounds per day, about one-half pound of which is waste. The consumption of zinc per ton of ore treated is .45 pound; the greater part of this is consumed by the refining process, and but a small proportion is dissolved in the boxes. The cost of cutting the shavings is 2.7 cents per pound, bringing the total cost at the mill to 9.36 cents per pound, or 4.66 cents per ton of ore. The precipitation of the bullion offers few difficulties, and is usually very perfect. Normally the sumps carry from one or two grains to four or six grains of gold per ton. Occasionally, however, when the solution carries much copper, the degree of precipitation will be poorer, especially in the weak boxes, and cases will sometimes be observed when the weak solution has re-dissolved the precipitated gold, running out of the boxes many times higher in value than when entering.

The remedy for this is periodical flooding of the weak boxes with a stronger gold-bearing solution; frequent re-arranging of the zinc in the compartments; and, perhaps, occasionally entirely removing the zinc from the boxes, placing it in the strong boxes, and putting in its place zinc coated with a metallic film of lead or mercury. No effort is now made to prevent the depositing of the copper on the zinc with the gold, as it was found that, when pains were taken to keep the copper out of the extractors, the solutions speedily became overcharged, and eventually the copper would come down in such a strong coating that the bullion was almost if not quite excluded. The overcharging of the solutions with the double cyanide of copper has a most vitiating effect on their dissolving power, and a solution fouled in this way will take infinitely longer to make the same extraction as a fresh solution; and in some cases the same extraction cannot be approached at all, even with a prolonged contact. A solution fouled in this way is usually very low in its dissolved oxygen content, and it is probable that this influences the rate of extraction to some extent. A little copper in the solution is undoubtedly a very efficient aid in precipitation, and it is only when the copper is allowed to accumulate that difficulties are encountered here in the extractors. The sump solutions usually carry .015% to .020% copper; and, as long as this is kept fairly constant, satisfactory results ensue. An average of a number of analyses on the incoming and outgoing solutions shows:

	Per cent Cu.	Per cent Zn.
Strong gold tank solution.....	.025	.073
Weak gold tank solution.....	.0188	.036
Strong sump solution.....	.018	.0745
Weak sump solution.....	.017	.037

The solutions, before pumping to the leaching vats, are aerated for an hour. This raises the dissolved oxygen content considerably, but, on standing for some time after aeration, some of the dissolved oxygen diffuses in the atmosphere.

Estimations of the dissolved oxygen in the solution at various stages in the process are:

- (1) Solution in sump before aerating and standardizing, 2.30 milligrams per liter.
- (2) Solution as pumped to leaching vats after aeration, 7.35 milligrams per liter.
- (3) Solution after standing on vat charge for one hour, 6.80 milligrams per liter.
- (4) Solution after leaving the vat at gold tank, 2.22 milligrams per liter.
- (5) Solution after leaving the zinc boxes, 0.82 milligram per liter.

*Trans. Am. Inst. Min. Eng. (condensed).

The weak solution contains about the same amount of dissolved oxygen in all cases except when leaving the zinc boxes, where it is slightly higher than the strong solution, containing, in several cases, 1.50 milligram per liter.

CLEAN-UP OF THE ZINC BOXES.—This is made monthly. The cyanide solution is displaced by running a stream of water through the boxes, which thoroughly washes the zinc in each compartment; the fine sludge is then screened, sluiced down the side launders, and settled in the reduction vat. The remaining zinc is replaced in the upper compartments, the lower end of the box being replenished with fresh zinc, and the solution, strengthened for a few hours with a little cyanide at the head of the box, is again turned in. There is no handling of the valuable precipitates, everything being sluiced by gravity to the settling vat. When all the extractors have been deprived of their zinc-gold slimes, the vat is allowed to remain undisturbed for a few hours. The supernatant liquor being siphoned off as closely as possible, sulphuric acid (specific gravity 1.84, and costing 1.80 cent per pound at the works) is applied, with constant stirring, till all action ceases. The vat is then filled with water, settled, the liquor siphoned off into a settling tank directly under the reduction vat, and a succession of water washes applied as rapidly as possible, siphoning off as soon as sufficiently clear. The small amount of values contained in the wash settling vat is cleaned up at long intervals. It is desirable to leave a portion of the sulphates behind, in order that a regulus or matte may be formed in melting. A considerable quantity of the copper is matted off in this way, leaving a comparatively fine bullion.

After washing, the slimes are partially dried on a blanket filter and removed to a hearth furnace (hearth 6x4½ feet), and subjected to calcination for four hours at a dull red heat. When cooled, the product is transferred as required, mixed with a suitable flux, and smelted in graphite crucibles, in two wind furnaces (20x20x28 inches). The flux found to be most suitable is composed of borax, 4½ parts; soda, 2½ parts; carb. potash, ½ part; silica, 2½ parts. The flux is mixed with calcined precipitates in the proportion of one to two.

No niter is used in the preliminary melt, as it is preferable to combine the base metals with sulphur, rather than attempt to remove them as oxides. The corrosion of the crucibles is also slighter than when niter is used. When the charge is thoroughly quiet and fluid, the slag is skimmed off repeatedly with a drop forged iron ladle, fitted with a handle bent almost at right angles, to save the attendant from the heat of the fire. The crucible, when sufficiently filled with molten metal, is removed, and contents poured into moulds. The casts are quickly emptied and thrown into a tub of water, to facilitate the removal of the matte. The latter, in addition to some bullion value, contains some 60% of copper and a small per cent of zinc. The bars from the first melt are freed from matte with a few blows of the hammer, and are re-melted in No. 20 crucibles, refined with a little niter and boneash, and carefully cast into bars of 500 ounces weight, pickled in dilute acid, cleaned, and packed ready for shipment. The first pouring is conducted at a high temperature, to insure the ready and clean removal of the matte on chilling. The final melt is, however, poured at a much lower temperature, and the finished bars are very tough and quite malleable. The slag and matte are bagged, and shipped to the smelter.

In a recent clean-up, in which over 5000 ounces of bullion was obtained, 800 ounces of matte was formed in melting, containing .345% of the total value, and 7200 ounces of slag in which .62% of the total value was locked up for a time. The average value retained by the matte and slag may be safely estimated at a trifle under 1% of the value contained in the precipitate.

The matte carries a greater silver value (usually two to one) than gold, while in the slag, values are about equally divided.

The labor involved in cleaning the extractors, tending acid refining and subsequent drying, calcining and melting, the sulphuric acid used, and the fluxes, crucibles and fuel, cost altogether (on an average of a number of clean-ups) 1 cent for each dollar in bullion produced.

The total working costs per ton are given in the following table:

THE COST OF TREATMENT PER TON.	
Labor.....	\$0.20
Cyanide.....	0.286
Zinc.....	0.0466
Lime.....	0.0140
Elevation of pulp.....	0.0375
Cleaning up, refining and melting, labor, supplies	0.0437
Sundries: Filters and shovels, etc.....	0.0065
Chemical supervision and assays.....	0.0875
Total cost.....	\$0.7218

These costs are for the combination of single and double treatment at present in vogue here; should all the mill be changed to single treatment, as is probable, the future working costs would be reduced 15 to 18 cents per ton, on the same monthly tonnage.

The plant for the treatment of dam slimes is at

work during the four summer months, and has a capacity of sixty to seventy-five tons per day.

Since writing the above, a filter press has been installed to facilitate the cleaning up of the zinc gold slimes. The press is an open delivery, two-eyed pattern, with flush plates and distance frames, forming a cake 1 inch thick. Each press charge of twenty-four cakes weighs, when dry, about 350 pounds. The cakes are 19 inches square, and are formed between a layer of heavy woolen filter cloth, covered with filter paper.

During the clean-up of the precipitation boxes, the liquor in the reduction vat is continually siphoned into a small sump, and elevated by a Poble air lift 5 feet into a monteju, and from thence forced by air pressure through the press, to remove any solid matter. The contents of the press are added to the slimes remaining in the vat, and the mass subjected to treatment with sulphuric acid, with constant mechanical stirring.

When the reduction has been completed, the refined slime and acid liquor is delivered to the monteju, and kept, by the compressed air, at a pressure of sixty pounds for two or three hours. This contact under pressure with dilute sulphuric acid removes much of the copper, leaving a very pure product for subsequent melting. The contents of the monteju are forced into the press, and the liquor, heavy with copper and zinc, removed; the press cakes are washed by water under pressure to remove sulphates, and finally dried in compressed air. When removed to the melting room, for drying and melting, the cakes contain about 17% moisture, and are tolerably free from sulphates.

The filter press, with the monteju, has proved a very valuable aid in the monthly clean-up, rendering the loss of gold practically impossible, and saving considerable time.

The Manufacture of Plaster of Paris.

Written for the MINING AND SCIENTIFIC PRESS.

The gypsum should be crushed with a first-class crusher—jaw crusher preferred—down to about 1-inch cubes. If a jaw crusher is used, the opening should be 20x12.

The crushed rock should then be dried on a rotary, direct-heat dryer. The products of combustion should not pass through the material, unless oil, gas or coke is used for fuel, but should pass on the outside of the dryer. The size of the dryer depends upon the capacity required, and should have in connection with it a good dust chamber for settling the dust, which is valuable.

After drying, the material should again be crushed in an ordinary howl crusher. It is then ground to about 80 mesh, usually on French buhrstones or in some pulverizer, as may be desired.

The ground material is then passed into a calcining kettle, usually about 8 feet diameter and 8 feet high, with cross flues, fire front, graters and doors, and also with upright shaft and stirrers near the bottom, driven with heavy gears above.

The material is slowly fed into the calcining kettle, when it soon begins to boil; more material is gradually added until the kettle is full. From rock that has been crushed and dried thoroughly, a charge can be calcined in about an hour and a half, depending on the dryness of the gypsum, also of the finished product. The material contains enough moisture to thoroughly boil for a short time, when it comes to a dead state, and then will boil the second time, and, in some cases, even the third time. The more times it boils the better the quality of the material. Gypsum contains over 20% water of crystallization. For ordinary plaster work but one boiling is necessary. For fine work and plaster of Paris two boilings are essential. This is where the chemical change takes place. After it is sufficiently calcined or boiled, it should be immediately emptied and placed in hoppers or bins, constructed of brick or iron, after which it is ready to be conveyed and elevated to the storage bins, to be packed in barrels or sacks, ready for the market. As soon as the kettle is emptied another charge should be immediately put in.

To manufacture ten tons of plaster of Paris an hour would require the following machinery:

A breaker for crushing the material to 1-inch cubes; estimated price, \$1000.

Rotary direct-heat dryer, 48 inches diameter, 27 feet long, together with dust room; estimated price, \$2500.

Bowl crusher for crushing the material after drying fine enough to grind on buhrstones; estimated price, \$300.

Four French buhrstones for grinding; estimated price, \$1200.

Two calcining kettles; estimated price, \$1200 each.

Necessary hoppers, bins, conveyors and elevators. For power it will require an engine of about 150 H. P., with the necessary boilers for same.

If it is desired to make this material into wall plaster—which is now largely done—in addition to the above, it will be necessary to have a dryer for drying sand and a hair picker for picking the hair, and the necessary dry mixers for mixing the different materials.

Water Hoisting in the Anthracite Region.*

NUMBER II—CONCLUDED.

Written by R. V. NORRIS, of Ilvesbarre, Pa.

In discharging, either arrangement may be made for taking care of the double discharge, or, where this is undesirable, only one valve may be opened, making the discharge in all respects similar to that at present used.

The time required for emptying bottom-dump

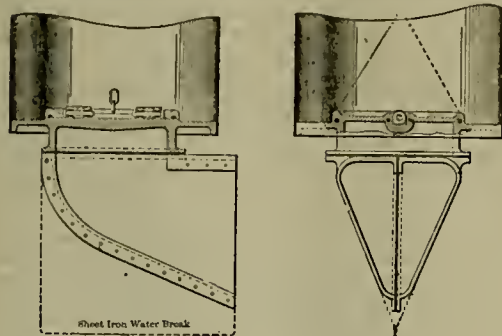


FIG. 5.

tanks averages about eight seconds, while the actual stop for end dumps is but about two seconds, though some of this advantage is lost by the necessarily slower landing of the latter.

While all the regular water hoists are in shafts,

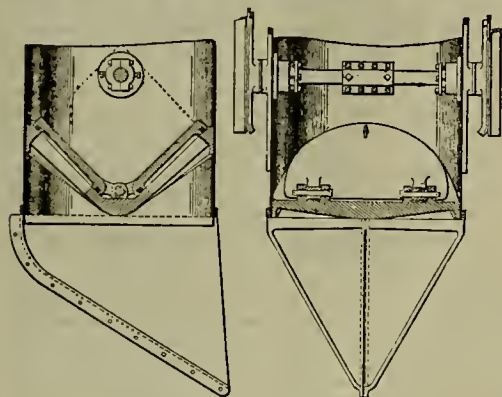


FIG 6.

very large quantities of water have been hoisted from slopes in emergencies. The tanks are usually of the end-dump type, though not used tandem, and have done excellent work. The principal objections to their regular employment are: the rapid wear of the wheels caused by acid mine water working into the bearings and replacing the oil; the slower hoisting speed necessary for tanks running on wheels, as compared with those in shafts sliding on guides; liability to derailment at any point of the hoist; the extreme danger of derailment when entering the water; and the danger, on flat slopes, of obstructions remaining on the rails under water.

There is, however, now being erected at the Hickory Ridge colliery of the Union Coal Company, Shamokin, a permanent water hoist on a 70° slope (Fig. 9), in which it is believed that many of these difficulties have been obviated. The tanks have a capacity of 1400 gallons each, and are mounted on closed, self-oiling wheels with bronze bushings, and close-fitting bronze shields in the end of the hubs, which fit over bronze collars on the axles. The wheels are made

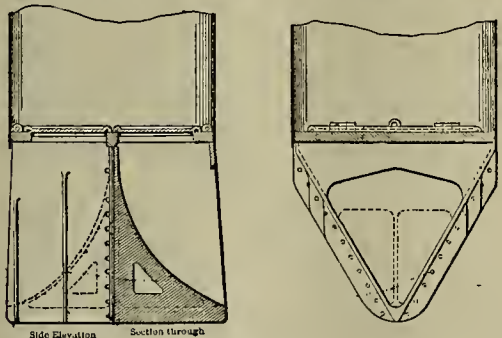


FIG. 7.

with extra high flanges, and the tank is provided with top and side shoes, as shown, which slide in between permanent guides, at the foot of the slope, extending 20 feet above the water line, to avoid danger of derailment when striking the water; the pitch being 70°, there will be no danger of obstructions remaining on the rails under water.

* Trans. Am. Inst. Min. Eng. (condensed.)]

The three water hoists on which costs of operation are available are the Luke Fidler, Lytle and William Penn shafts; of these the William Penn was first started, October 30, 1902, to unwater the colliery after the strike, the plant having been finished during the trouble; the Lytle has been in operation for about two years; but, owing to the uncompleted condition of the colliery, its work has been irregular, except in removing the water which accumulated during the strike; while at the Luke Fidler plant the records are in excellent condition, excepting the steam consumption, which is unavailable.

The Lytle shaft was filled to a depth of 860 feet during the strike and the water, amounting to 274,083,500 gallons (36,727,000 cubic feet), was hoisted out in thirty-seven days and four hours. Besides the regular water hoist, tanks were used in all four coal compartments; the plant then consisting of two pair of 2600-gallon (348 cubic feet) tanks, with a pair of 36x60-inch first-motion engines for each pair; also one pair of 1500-gallon (201 cubic feet) tanks operated by a pair of 30x48-inch Corliss engines; the total water hoisted by each was:

	Water Holsted.		Average Per Day.	
	Gallons.	Cu. Ft.	Gallons.	Cu. Ft.
Water hoist	113,154,600	15,162,716	2,977,753	399,019
Large coal hoist ..	106,519,400	14,273,600	2,803,142	375,621
Small coal hoist ...	54,409,500	7,290,873	1,431,829	191,865
Total.....	274,083,500	36,727,189	7,212,724	966,505

The hoisting during November was regular; 236,906,000 gallons (31,745,300 cubic feet) were hoisted

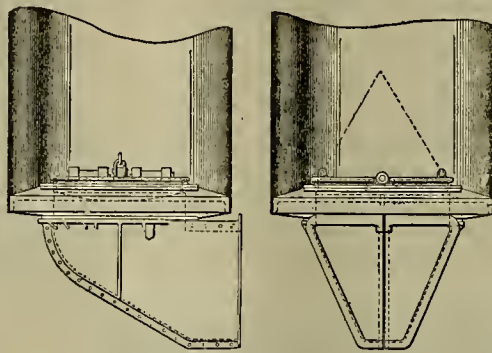


FIG. 8.

from an average depth of 740.6 feet. During this time the boiler plant (12-150 H. P. return tubular boilers and one 500 H. P. B. & W. boiler) was devoted exclusively to this hoisting, burned 4122 tons of coal, and was supplied with 6,206,100 gallons of metered water,

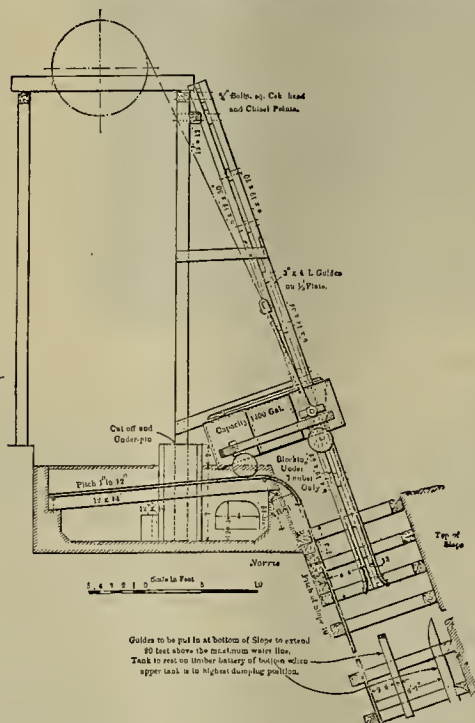


FIG. 9.

which would indicate an average evaporation on 5.55 pounds per pound of coal. Allowing 15% of the water supplied for use in blowers, condensation and waste, it would be equivalent to about 44,004,000 pounds of dry steam at the engines, giving an approximate duty of 33,260,000 foot-pounds per 1000 pounds of dry steam, or 59½ pounds of steam per actual horse-

power hour in water lifted, and 251 pounds of steam per 1000 gallons lifted 1000 feet (1878 pounds of steam per 1000 cubic feet water lifted 1000 feet, or about 30 pounds steam per 1,000,000 foot-pounds in water). This is based on the assumption that the steam used would be proportional to the hoist, which would be, if anything, against the plant.

The cost of steam during this month was as follows:

Labor, repairs and supplies	\$934 62
Water.....	496 49
4122 tons coal, at 50 cents per ton.....	2,061 00
	<u>\$3,492 11</u>

Thus, about 44,004,000 pounds of dry steam delivered at the engines cost \$0.0794 per 1000 pounds (labor, repairs and supplies, \$0.0326; fuel, \$0.0468); equivalent to \$0.0198 per 1000 gallons hoisted 1000 feet vertically (\$0.1485 per 1000 cubic feet); or \$0.00238 per 1,000,000 foot-pounds in water; \$0.00472 per horse-power hour in water; cost of steam, only, per year, per boiler horse power, twenty-four hours per day, including labor, supplies and repairs, \$8.57; fuel, \$12.30; total, \$20.87. The cost for generating steam at the collieries of the Lykens Valley Co., figured on the same basis, allowing 15% waste as above, is \$0.0311 per 1000 pounds dry steam delivered at pumps (\$0.0389 for labor, repairs and supplies, and \$0.0422 for fuel), and averages \$17.04 per year per boiler horse-power twenty-four hours per day.

The cost of the steam supplied has been gone into in detail in this place because this plant is the only one at which a single boiler plant has been devoted to water hoisting for a sufficient time to arrive at a fairly accurate estimate of the cost of power, and the figure here obtained, 2 cents per 1000 gallons (15 cents per 1000 cubic feet), raised 1000 feet vertically, will necessarily be used throughout this paper. The cost of hoisting, exclusive of steam, during this month was \$1676.74, or \$0.0071 per 1000 gallons (\$0.053 per 1000 cubic feet) hoisted, including all supplies, labor and repairs.

The new plant of the William Penn No. 2 shaft, which was flooded to a depth of 250 feet, hoisted 112,468,080 gallons (15,070,730 cubic feet) of water from Oct. 30 to Dec. 5, 1902, inclusive, using the pair of regular water hoist, 32x48-inch engines, and the pair of 28x48-inch coal engines, with 1440-gallon (193 cubic feet) end-dump tanks (Fig. 4), and 1320-gallon (177 cubic feet) emergency bottom-dump tanks (Fig. 7), the record being:

	Water Hoist.	Emergency Hoist.	Total.
Tanks hoisted.....	48,269	32,546	80,815
Hours actually worked.....	805½	593½	1,403½
Tanks per hour.....	59.9	54.4	
Gallons hoisted.....	69,507,360	42,960,720	112,468,080
Cubic feet hoisted.....	9,313,985	5,756,745	15,070,730
Average depth hoisted, ft.....			727.8

The total cost, exclusive of steam, was \$987.83, or \$0.0088 per 1000 gallons actually hoisted (\$0.066 per 1000 cubic feet).

The following is the record of the Luke Fidler shaft water-hoist 32x48-inch engines, with 1450-gallon (188 cubic feet) tanks, for the three years of regular operation—1899, 1900 and 1901:

Height of hoist, feet.....	960
Number of tanks hoisted.....	633,456
Average number per year.....	211,152
Gallons hoisted cu. ft.....	918,501,200—123,079,160
Average per year (gals.), cu. ft.....	306,167,067= 41,026,386

		Per 1000 gals.	Per 1000 cu. ft.
Cost of labor.....	\$6,372.00	\$0.00695	\$0.05212
Supplies and repairs, in- cluding two new ropes, sheave and tank.....	4,087.20	0.00445	0.03337

Total, exclusive of steam.	\$10,459.20	\$0.0114	\$0.0000
Steam on basis of Lytle figures }	17,635.22	0.0102	0.1440

Total cost.....	\$28 094.42	\$0.0306	\$0.2295
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This plant was, however, operated at only about one-third of its capacity. At full capacity its cost is estimated to average about $2\frac{1}{2}$ cents per 1000 gallons for 360 feet vertical.

The summary of the operating cost of the three plants just referred to is as follows:

PLANT.	Fidler	Wm. Penn	Lytle
TIME.	3 Years.	37 Days.	1 Month.
Depth of shaft, ft.....	960	953	1,500
Quantity hoisted, gals.	918,501,200	112,468,080	236,906,000
Quantity hoisted, cu. ft.	123,079,160	15,070,730	36,727,189
Av. height hoisted, ft..	960	727.8	740.6
Cost labor, repairs, supplies per 1000 gals....	\$0.0114	\$0.0088	\$0.0071
Cost steam per 1000 gals	0.0192	0.0146	0.0148
Total cost 1000 gals..	\$0.0306	\$0.0234	\$0.0219
Total cost 1000 cu. ft..	0.2295	0.1755	0.1643

This is much less than (about 69% of) the average cost of pumping at the collieries of the Lykens Val-

ley Coal Co., where it was \$0.37 and \$0.29 per 1000 cubic feet 1000 feet vertical, and \$98.11 and \$81.47 per horse power year in water for the years 1901 and 1902, respectively, and which it was estimated could be reduced to about 25 cents and 19 cents in the respective years by the use of a modern compound condensing pumping plant. In this comparison it should also be considered, however, that the steam cost of hoisting could, if desirable, be proportionately reduced by the use of compound engines, condensing or non-condensing, or even by running the present simple engines as condensing.

Aside from the question of cost, however, there are many very great advantages in hoisting water, particularly from deep shafts: In the simplicity of construction; having all the operating machinery on the surface, with the resulting low cost of repairs, which are practically confined to tanks and ropes; the almost total absence of slip, which under mining conditions reduces materially, from the quantity calculated from "plunger displacement," the actual quantity of water pumped; the avoidance of underground steam lines, with their large condensation losses, damage to roof and timbering from the heat and exhaust steam, and the danger of fire incident to their use; the almost total freedom from danger of falls or squeezes in the mines; and, most of all, because the operating plant cannot be flooded.

These advantages were brought home most forcibly to the anthracite operators last year, when, after a six months' strike, the water hoist collieries were promptly unwatered, while in our case, at least those where the pumps had been drowned, they are still flooded in the lower levels. The history of the Lytle colliery, a notoriously wet one, also furnishes a case in point. Until the accession of the present management the regular report was, "We are holding the water," and it required seven months of unremitting effort, moving pumps down the slopes, and a tremendous expenditure of money, to clear the colliery of a volume of water barely equal to that removed by the hoisting plant this fall in thirty-seven days, at an expenditure, excluding the value of the coal burned, of \$5918.63.

It is also to be noted that, on account of the strain of this constant work on the hoisting engineers, it is the custom to have them work in three shifts of eight hours each.

Boiler Room Economy.

The accompanying cut illustrates a form of economy in the boiler room by use of an industrial railway as



Industrial Railway in Boiler Room.

furnished by the C. W. Hunt Co., West New Brighton, Staten Island, N. Y.

In small steam plants little attention, as a rule, is given to the handling of the coal and ashes. Where only one or two boilers are employed a wheelbarrow is considered the cheapest and easiest means of bringing the coal from the storage bins to the furnace door, simply because the wheelbarrow is capable of transporting as much coal as is required and as rapidly as it is wanted, for the boiler consumption. Much time is wasted in keeping the floor clear of the coal which trickles from the barrow on its way to the furnace, and the untidy appearance of the boiler room with the coal dumped in a heap at the furnace door is discouraging to the fireman.

To install an industrial railway, equipped with a charging car, is not a costly item. It is a convenient way of carrying coal to the boiler room, and is the least laborious in firing, as the coal is at the most convenient distance from the furnace and at the right level for ease in shoveling. The coal remains in the car until it is shoveled directly into the furnace, and the floor of the boiler room is kept entirely free from dust and dirt. The center of the car truck should be about 8 feet from the boiler front.

The car is designed for bringing coal from the stor-

age bins to the boiler rooms, and is made of sheet steel stiffened with angle iron, the rivets spaced 2½ inches apart, the corners rounded for the workman's hand, the bottom flush riveted, and specially arranged to have the surface of the door when let down a little higher than the floor of the car, so that the coal shovel will not catch on the edge of the car bottom. The tipping body cars have a dumping gear which keeps the body completely under control in dumping the load, and prevents the violent shocks that occur when the body dumps by gravity alone. The cars have springs, which make them run easily and ride smoothly. The hearings are fitted with reservoirs filled with oil and packed with sponge, thus insuring constant lubrication. They have our patent steel wheels, pressed on the axles, and flexible bearings for running easily around a curve of 12 feet radius. A wheelbarrow with a carrying capacity of 250 pounds would have to make eight trips to handle the amount of coal which a charging car carries at one time, namely, 2000 pounds, and less effort is required to move the car with its ton load than the wheelbarrow with its 250-pound load.

Midsummer Measurements of California Streams.

During the summer of 1898, which was one of very great drought throughout the State of California, measurements of low water were made under direction of J. B. Lippincott in numerous streams upon which ordinarily no observations had been taken. These low-water measurements have been made in August, September and October of each succeeding year, including 1902.

Aside from the values of these measurements to irrigators, they have proved to be of much interest and value to those making or contemplating water power development for the generation and distribution of electric energy, because of the fact that the minimum flow of the stream is the controlling factor that determines the size of the plant in all cases where storage of the flood waters is impracticable.

During the summer of 1902 more extensive measurements were made than in any previous year. A hydrographer was placed on the trunk stream near the mouth of the canyon. He was instructed to set up and maintain an automatic steam register; to make a number of measurements at the point selected for the register, and to travel up and down the trunk stream during the period that the register was maintained and make careful meter measurements to determine the relative loss and gain in the main river between points of observation. At the same

time another hydrographer traveled through the upper portion of the drainage basin measuring the principal tributaries at available road and trail crossings. A programme was arranged between these two men so that as far as possible the stream and its principal tributaries were measured both below and above on the same day.

These synchronous measurements were made on the Sacramento, Feather, Yuba, Mokelumne, American, Stanislaus, Tuolumne, Merced, San Joaquin, Kings, Kaweah, Tule and Kern rivers.

Single measurements were also made of numerous other streams in California. A blue-print copy of the tabulation of these results can be obtained prior to their publication in the Annual Report of Stream Measurements by applying to J. B. Lippincott, Resident Hydrographer, 408 Byrne Bldg., Los Angeles, Cal.

THERE are at present in California thirty-six oil refineries, with a total still capacity of 39,871 barrels. Of these seven are at tide water tributary to San Francisco bay, twelve in the San Joaquin valley, five at points along the coast, eleven in Los Angeles and one at Chino, San Bernardino county. In addition there are six others under construction.

Accidents Due to Combustion Within Air Compressors.*

[By ALBERT R. LEDOUX, New York City.]

With the improvements in design and efficiency of machinery the element of danger in its use is becoming less, but it is a question whether the strain involved in operating modern plants is not increasing somewhat the danger of accident due to human fallibility.

I propose to describe a somewhat uncommon casualty resulting from a not infrequent incident in the use of air compressors, and partly due to lack of judgment of the engineer and lack of care in operation. It is not necessary to state the location of the mine in which the accident occurred nor the makers of the compressor, and the object of this brief paper is more to draw out suggestions from members more familiar than I am with the practical handling of mining machinery than to point a moral.

The compressor in question was a three-drill machine of standard make. At the time of the accident it was furnishing air to a single drill working in an upraise from a well-ventilated tunnel, and giving ventilation to a winze below the tunnel, where two men were hand drilling. The compressor also furnished power to a small hoist in the winze, but the hoist was only operated occasionally, and never while the drills were working. The drills were located about 1200 feet from the compressor. The engineer testified that he never had been short of air, and that there had been no complaints that the machine was inefficient. The engineer testified, further, that the water used in cooling the air cylinder had never become greatly heated, but that he used a mixture of good cylinder oil and of a lighter grade known as "Atlantic Red." The valve of the compressor was set to blow off at eighty pounds. He was eating his luncheon in the boiler room when he heard a "crack like a pistol," and, going into the engine room, found water spurting out of the jacket about 2 feet from the end of the compressor. He tightened the jacket and stopped the leak, and found that the jacket was perfectly cool. He next noticed that "grease began to fry on the pipe and receiver."

He next saw that the air pipe had become red hot, the heat extending to a point where the pipe went through a wooden partition, setting fire to it. Then he noticed that the pressure was going down "just as quick as if some one had opened a valve outside," which, in fact, is what happened. He stopped the engine, but, getting the signal for more air, started up again. It is well to note at this point that the intake of the compressor was in the engine room, the temperature of which usually stood at 115° F.

Let us now see what occurred in the mine. What happened at the bottom of the winze cannot be better told than in the testimony of one of the miners at the coroner's inquest: "I was turning a hole and my partner was striking the drill. He says, 'We ain't got much air here this morning; I will ring for some more air.' He rang, started to strike again, and struck two or three blows, straightened up and took a couple of breaths of air, and started in to strike again, and then quit. I had been joshing him, and says, 'You ain't as tough as you used to be.' I stood up, picked up a pick, struck two or three blows, and felt that the air was had. Just then the air stopped, and the hoister tender hollered to us that there was no air and we had better come up. I looked around and seen my partner standing in the corner. He was all trembling, and I caught him as he fell over."

These two men were gotten up by heroic work on the part of comrades and their lives were saved. But not so fortunate were the men in the upraise. There were four of them here, and when they felt the air getting bad they opened the valve full—of course, only increasing the difficulty. They were experienced miners, and at first could not understand what was the matter with them, because their candles continued to burn as usual. This was due, undoubtedly, to the fact that they were working in an upraise, and that the heavy carbonic acid gas sank, and perhaps to the fact that carbonic oxide may have been generated through incomplete combustion or the reduction of the carbonic acid, first formed, by the glowing carbon in the pipe.

Two men were killed and four others barely escaped with their lives as a result of the combustion of the oil, deposited carbon and organic dust accumulated in the compressor, receiver and pipe. Explosions of air compressors due to this cause have been frequent, and lives have been lost thereby, and what is known as the "flaming" of compressors or cylinders is an every-day experience, and in some cases the rupture of the air pipes, but, so far as I can ascertain, without the serious consequences described in the present case.

I shall leave to those better qualified than I the discussion of the best means of preventing such catastrophes. Among those which suggest themselves are the taking in of the air from a point where its temperature is as low as possible, the introduction of auxiliary coolers, the use of as heavy oil as

*Trans. Am. Inst. Min. Eng.

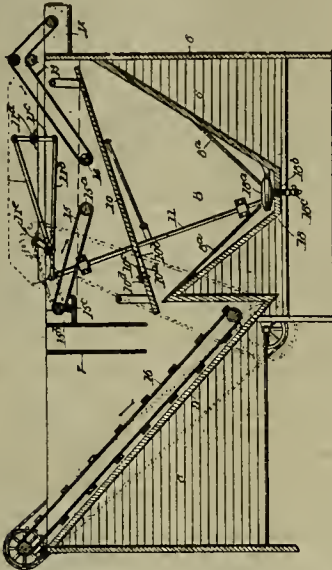
possible—yet never in excess—the cleaning out of cylinders, receivers and pipes, and especially a warning to the engineer to be very sure, when he receives a signal for more air, that the actual shutting down of the compressor may not be more essential. In this case, had he shut down it is probable that no lives would have been lost, for with the stopping of the air the miners would have at once returned to the tunnel level.

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 21, 1903.

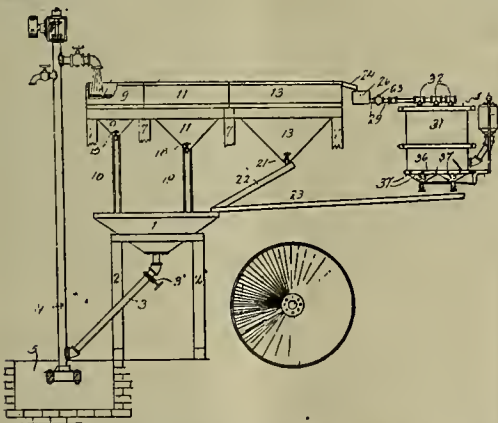
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE SEPARATOR.—No. 725,609; J. W. Wolfe, Randolph, Iowa.



Combination with tank adapted to contain liquid, submerged hopper therein, vibrating collecting pan in tank under hopper, covered by convex separating sieve close to lower edge of hopper, forming a narrow escape opening.

APPARATUS FOR THE TREATMENT OF GOLD OR OTHER ORES.—No. 725,864; W. B. McPherson, Los Angeles, Cal.



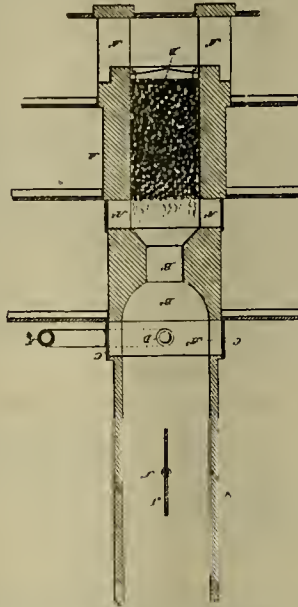
Precipitating apparatus for depositing gold and silver from solution of cyanide of potassium and from other solutions consisting of precipitating box for holding solution, provided with valves and series of electric conducting plates, connected with source of electric supply, gauge receptacle having float adapted to reciprocate therein, means for connecting reciprocating box and gauge receptacle, yoke secured to float, valve rod, devices for connecting yoke and valve, rod and valves adapted to be operated by rise and fall of float within receptacle.

ELECTROLYTIC SEPARATION OF COPPER AND NICKEL FROM MATTES OR ORES.—No. 725,998; E. A. Sjostedt and J. H. James, Sault Ste. Marie, Canada.

Electrolytic process separating copper and nickel from mattes and ores, consisting in concentrating, crushing and desulphurizing matte or ore, dissolving out metals by dilute sulphuric acid heated to boiling, diluting cool liquor to redissolve salts which have crystallized in cooling, thus bringing it to point at which just hold salts in solution, electrolyzing solution with current of normal density about 0.3 ampere per 100 square centimeters cathode surface while being agitated with current of air until most of copper has been deposited and deposit begins to darken, running off solution to treat fresh matte or ore, re-

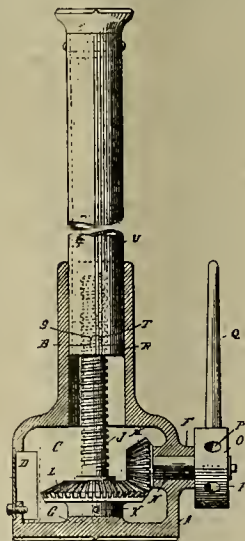
peating electrolysis and solution as before often as profitable, finally depositing as much as possible of copper in adherent form by reducing current whenever copper deposit begins appear dark, nearly neutralizing remaining solution with caustic soda making it ammoniacal, oxidizing iron by blast air, filtering precipitated ferric hydrate and electrolyzing liquor to deposit the nickel (using nickel cathodes and graphitized carbon or other insoluble anodes) with current normal density from 0.6 to 0.9 ampere per 100 square centimeters cathode surface while heated 80° or 90° Centigrade, and agitated by current air.

CEMENT KILN.—No. 725,975; W. W. Maclay, Glens Falls, N. Y.



Continuous burning Portland cement kiln, comprising shaft-like structure having openings at bottom and provided with combustion chamber, throat above combustion chamber, and preheating chamber above throat, in combination with regular suction device connected with preheating chamber, and with valve or damper located between preheating chamber and top of kiln so that draft exerted through combustion chamber by suction device be regulated by adjusting damper.

MINING COLUMN BAR.—No. 726,066; A. Johnson, Butte, Mont.

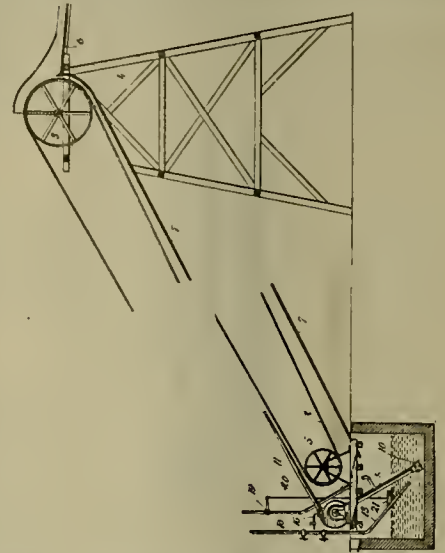


Combination of hollow base having securing exterior ribs, horizontal shaft mounted in base, means on outer end shaft for turning shaft, vertical disposed bevel pinion on inner end of shaft, horizontal bevel gear meshing with pinion, vertical screw mounted in base and connected to gear wheel, collar having lugs and column resting on collar and having recesses to receive lugs, screw engaging collar and column, and cap on column having exterior securing ribs.

TREATMENT OF MATTES AND RAW METALS.—No. 725,297; H. G. C. Thofehrn, Paris, France.

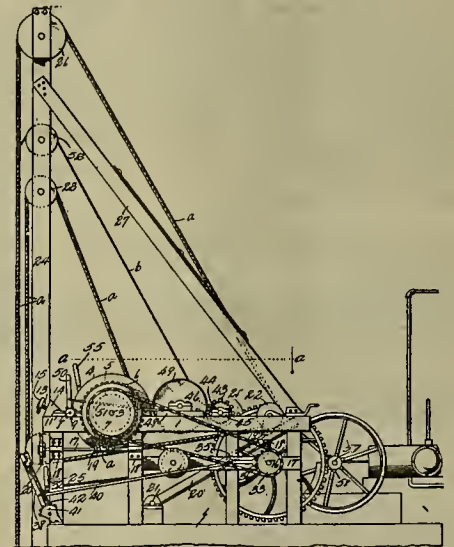
Treatment of copper of copper mattes, raw copper, nickel mattes, tin or lead mattes, cast iron, with view of obtaining metallic copper, nickel, tin, lead, steel or puddling iron, consisting in blowing in hearth furnace onto surface of metallic bath formed of mattes or raw metals and by means of blast pipes distributed around furnace, mixture composed of oxidizing agent formed of steam and air, solid oxidizing agent formed by oxides of metals to be treated previously brought to state of grains, metallurgical flux previously reduced to grains and hydrocarbons.

CONVEYOR.—No. 726,098; J. B. Pitchford, Randfontein, Transvaal, South Africa.



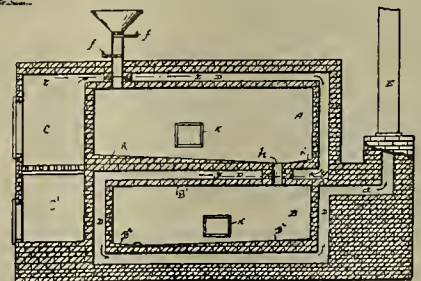
Conveyor comprising inclined endless belt, sump at lower end thereof, suction pump arranged over sump, suction pipe leading into sump, and discharge pipe leading from pump to point over lower portion of belt, pipe having flattened end and pump operating discharge material onto belt.

WELL-DRILLING MACHINE.—No. 726,174; J. R. Lewis, Weatherford, Tex.



Combination crank shaft, drill beam operated thereby, master wheel loose on crank shaft, clutch on latter connect master wheel thereto, sprocket wheel on crank shaft, clutch to lock sprocket wheel to master wheel and disconnect therefrom, counter shaft having gear engaging master wheel and having friction wheel, mud-bucket drum in shiftable bearings and having friction wheel to engage and disengage that of counter shaft, drill-rope drum, sprocket wheel carried thereby, endless sprocket chain connecting sprocket wheels of drill-rope drum and crank shaft, and motor geared to master wheel.

SMELTING FURNACE.—No. 725,661; E. F. Blessing, Philadelphia, Pa.



A heating chamber, firebox therein, main muffle within chamber contacting with firebox, and continuous flue surrounding muffle and leading from firebox, supplemental muffle within chamber and beneath main muffle, flue surrounding supplemental muffle, and opening in bottom of main muffle communicating with supplemental muffle through top of latter, floor in main muffle inclined toward opening, tap opening in supplemental muffle at opposite end thereof from communicating opening of two muffles, floor in supplemental muffle inclined toward tap opening, and

extension on top of supplemental muffle forming partition between flue surrounding main muffle and exit of flue surrounding supplemental muffle.

DEVICE FOR EXTRACTING DRILLS, ETC. — No. 725,844; C. A. Horan, Stockton, Cal.



Grapping device consisting of stock, cage applied to lower end of stock and comprising thin sheet metal band of uniform diameter provided with two pairs of diametrically opposed arms integral with upper edge and extending upwardly therefrom and connected at upper ends to stock, bearing pieces upon inner faces of one pair of arms, pair of clutch plates having journals pivotally mounting them upon bearings and notched in edges to clear arms, whereby plates are adapted to seat on upper edge of sheet metal band, plates provided with segmentally recessed beveled biting edges at free ends, edges conjunctively forming elliptical opening, and horizontal grapping hook carried by cage.

PROCESS OF OBTAINING ALUMINA.—No. 725,683; C. A. Doremus, New York, N. Y.

Process of obtaining alumina by reacting upon aluminous material with acid containing fluorine, producing aluminum fluoride, and subjecting fluoride to action of superheated steam.

Gold Milling Practice in Bendigo.*

NUMBER II.—CONCLUDED.

Written by H. C. BOYDELL.

CONCENTRATING APPLIANCES.—These, until eighteen months ago, consisted entirely of blanket strakes and tables. The former are of the usual pattern and require no further description. The Halley table is a percussion table with an end shake. One is provided to each five head of stamps, and the cost of the machine erected is \$300. The pulp is in many cases badly fed onto these tables. Instead of being evenly distributed over the whole breadth of the table, it is delivered in a few irregular streams; surface currents are thereby set up and the efficiency of the machine is considerably reduced.

The Halley table is not suited for the production of clean concentrates. The treatment of the concentrates locally, however, renders this point of much less importance than it would be in the case of a mine situated at some distance from a metallurgical works. Four companies have recently erected modern tables of American manufacture.

DISPOSAL OF CONCENTRATES.—Two methods are in vogue. One is to sell the concentrates according to their assay value, the other is to have them treated at the local pyrites or chlorination works at a fixed charge of \$10 per ton, including cartage to the works. The gold recovered is returned to the company. Edwards' metallurgical works practice chlorination in small wooden vats, using gaseous chlorine, the necessary roasting being done in two Edwards' furnaces. The various pyrites companies grind and amalgamate after roasting, the latter operation being carried out in the old type of reverberatory furnace with steeply inclined hearth. The pans used have flat bottoms. The drags in many cases are of granite. In conjunction with the grinding pans, where the amalgamation also takes place, settlers are used, there being one settler to two pans. So far as I have been able to ascertain, there is no amalgamating pan in use on the field.

At Liddell's pyrites works the pulp from the settlers, which is very slimy, was formerly treated by A. Duncan by cyanide in his slime plant. At the present time the cyanide treatment is being carried

on by Mr. Liddell. As previously mentioned, the concentrates produced at all the mills are far from being clean. On an average they contain 50% of silica, and in many cases this rises to 70% and even 80%.

A number of samples of concentrates submitted to me for assay gave 2 oz. 1 dwt. 12 grs. as the mean value. However, as it is only rarely that the concentrates are assayed, it is difficult to arrive at the actual average; but the above figures may be taken as a close approximation. A considerable proportion of both coarse and slimed concentrates goes into the tailings with the present method of concentration. On examining a sample of tailings from one of the Bendigo batteries and assaying the portions retained on the different sieves, I found the results to be rather high (See Table B), and, suspecting that this might be due to the concentrates, which were clearly distinguishable in the tailings, I decided to go further into the matter.

Another sample of the same lot of tailings was washed, in order to get rid of the slimes—the latter in this case amounted to 40.73% of the amount taken. The coarser portion was then panned off to remove concentrates—the latter amounting to 1.03%. The pulp had been passed over Halley tables, and this large amount in the tailings clearly shows the inability of that machine to effect anything like a complete saving of the concentrates contained in the ore. The coarse portion thus freed from concentrates was then sieved through a series of sieves of decreasing mesh, and the portions retained in each sieve assayed with the following results:

TABLE A.

(1) Portion retained on 30 sieve	= 9.30% assay	15.68 grs.
(2) " " 40 "	= 7.51% "	7.36 "
(3) " " 60 "	= 15.45% "	19.60 "
(4) " " 80 "	= 10.93% "	19.60 "
(5) " " 100 "	= 8.03% "	15.68 "
(6) " passed 100 "	= 6.95% "	23.52 "
(7) Concentrates panned off	= 1.03% "	
(8) Slimes washed off	= 40.73% "	
99.93%		

The higher value of the various portions in the case where sieving only was adopted I attribute to the adherence of fine particles of concentrates to the larger particles. These fine particles of concentrates in the case where washing was adopted passed off with the slimes.

Time did not permit of an examination of the slimes obtained on washing; but I intend to further examine these with finer sieves and definitely locate the portion carrying the highest value.

DISPOSAL OF TAILINGS.—These, in most cases, have to be raised to some height to take them clear of the battery. The means adopted for doing this is pumping. The pump used is of the Cornish plunger type. In some cases the Tee bob is utilized for giving motion to the battery feed pump as well as the tailings pump. It is not unusual for the tailings, after being lifted, to pass over the canvas tables of some enterprising Chinamen before being finally discharged. The usual arrangement is for the Chinamen to pay a fixed sum per week for the privilege of treating the tailings of a particular company.

Owing to the lack of control by assay, it is difficult to state exactly the average value of the tailings. A. Duncan, who sampled many tailings heaps in Bendigo during the cyanide boom of some years ago, informed me that he found the average to be about 1 dwt. 6 grs. This, I think, may be taken as a close approximation, and in support of these figures it may be stated that in no case has it been found profitable to treat the many large tailings heaps existing on the field. The only cyanide work at present carried on in Bendigo is at Liddell's pyrites works and at Duncan's plant at Epsom. Experiments are being carried out on a small scale with the tailings from one of the Fosterville batteries.

CONSUMPTION OF WATER.—This averages 800 to 1000 gallons per ton of ore crushed. The water is usually kept circulating, special arrangements being made for the settling of the sand and slime before returning to the battery. The price of water taken from the open sluice is 12½ cents per 1000 gallons. The battery water usually contains considerable quantities of magnesium sulphate in solution. Many batteries on the field are dependent on the Government supply, the small rainfall and catchment areas available preventing any large quantity being stored.

SCREENS USED.—These are invariably punched, the use of wire-woven screens not having resulted in any increase in output in the few cases where they have been used. The punched screens are made locally by two firms. The average is from 12 to 16 holes to the linear inch, this giving 144 to 256 holes to the square inch. This corresponds with wire-woven screens of a mesh of from 16 to 32. The discharge area in the case of the punched screens is from 35 inches to 45 inches per square foot of screen surface and in the case of wire-woven screens from 65 inches to 70 inches per square foot of screen surface.

Curiosity with regard to the suitability of these sizes of screens to the ore prompted me to examine samples of tailings that had been crushed to pass a 175 punched screen (13 holes to the linear inch). This corresponding to a 25 mesh wire-woven one, yielded on sieving:—

TABLE B.

			Assay Value, dwt. gr.
(1) Portion retained on	30	mesh sieve =	6.72% 2 22.5
(2) " " "	40	" =	8.43% 2 68
(3) " " "	60	" =	16.54% 2 23
(4) " " "	80	" =	11.10% 1 23
(5) " " "	100	" =	15.24% 1 23
(6) " passed	100	" =	41.30% 1 17.8

Value of sample in bulk before sieving, 1 dwt. 28 gr.

Calling the portion that passed the 100 mesh sieve "slime," the tailings contained 41.30% of slime. By washing, another sample of the same lot of tailings gave 40.73% of slimes (Table A), the two results closely agreeing.

A 30 mesh wire-woven sieve corresponding with a punched screen having 200 holes to the square inch or 14 holes to the linear inch, and a 40 sieve to a punched screen having 300 holes to the square or 17 to the linear inch (the correspondence being in area of the holes), it can be seen from an examination of the figures that, although this ore was crushed to pass a punched screen with 13 holes to the linear inch, 93.27% of the pulp produced would pass through a screen with 14 holes to the linear inch and 84.84% through a screen with 17 holes to the linear inch.

The above data appear to me to afford abundant ground for adopting coarser crushing with an ore such as this. The sample experimented on was taken systematically at regular intervals for a period of one week. The presence of so much slime is accounted for by the fact that the stone crushed contained a good deal of slate, a material that passes through all Bendigo batteries in considerable quantity.

MOTIVE POWER.—This is in all cases steam, which is generated in boilers of many types. The one most used formerly was the Cornish; at the present day this has been replaced by the Cornish multitubular, internally fired. Some Lancashire and a few Babcock and Wilcox boilers are in use.

The fuel universally used is wood, the variety most favored being box. The wood is brought from many points within a radius of 30 miles of Bendigo. Some is carted and some delivered by rail. The use of the railway for this purpose has brought about a considerable reduction in the price. The average at the present time is \$1.60 per ton of 50 cubic feet. The calorific power of the wood used is generally accepted as being one-third that of good coal, though I cannot find any data regarding the estimation on which this is based. The estimation of the calorific power of the different woods used as fuel seems to offer a good deal of scope for original work.

COST OF CRUSHING.—This varies greatly, and it is a matter of impossibility, owing to the loose method of measuring the weight of ore and the absence of exact data, to arrive at figures that possess any great degree of accuracy. The conditions under which crushing is carried on at many batteries render the cost high, while in those batteries in which heavier stamps and labor-saving appliances have been adopted the cost is remarkably low.

Mr. Samuels informs me that at the New Chum mine, of which he is general manager, the cost of crushing is less than 50 cents per ton. The consumption of wood at this battery is one ton per 10.6 tons of stone crushed. This is equivalent to a cost of 7.3d per ton. The charge for public crushing is usually \$1.25 per ton, including labor. In no case can I find data regarding the different items of cost, such as labor, office expenses, mercury, shoes and dies, etc. In respect to tabulation and keeping of costs, there is much room for improvement on the field.

Generally speaking, it may be said that the cost is from below 50 cents to \$1.25 per ton. As the tendency seems to be to adopt labor-saving appliances, it is probable that the maximum figure will be considerably reduced.

At Fosterville cheap crushing has, and is still, being done. The low cost is accounted for by the ore, which is a gossan, being extremely friable and easily crushed, and it would be unfair to compare the cost of crushing this with that of the much harder stone occurring in Bendigo.

In conclusion it may be said that, although in many respects, more especially those of control and adoption of labor-saving machinery, Bendigo milling practice might be improved, still, in those sweeping condemnations of that practice, that have been made from time to time, sufficient allowance has not been made for existing conditions. The absence of large and continuous bodies of low-grade ore, such as exist in South Africa, does not admit of large batteries of heavy stamps being erected, sufficient stone not being available to keep such batteries working continuously.

Crushing costs have been reduced in many instances to a remarkably low point, solely by empirical means certainly, but still reduced to such a point as to challenge comparison with the best figures of other and larger fields.

It is quite likely that a mining man might come to Bendigo and see nothing in our milling practice that he would care to adopt in his work elsewhere; but at the same time it is extremely doubtful whether those who criticise our practice most freely would, if transferred to Bendigo, and working under existing conditions, do any better or even do so well as the local men in charge of the milling operations.

*Trans. Aus. Inst. Min. Engs. (condensed).

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

The Nevada group of mines, near Juneau, will be opened up this season on a larger scale. These mines are 2 miles below the Ready Bullion and 1 mile from Gastineaux channel. The company will put in a 10 stamp mill, a 12-drill compressor and run two tunnels, one 1000 feet, the other 1500 feet. It is intended to have them in full operation by July 15th, says the Record-Miner.

Manager S. Silverman of the Brown-Alaska Co., operating on Prince of Wales Island, says they are considering the erection of a 400-ton smelter this summer. The company owns the Mamie group of twenty claims and has done considerable development work. A ledge of copper-iron ore has been opened up.

Tacoma advises say the present indications are that by August at least twenty well-boring plants will be in operation in the Kayak and Coal Oil Bay districts of southern Alaska. Steamers sailing for Copper river are taking machinery and supplies for oil companies which have already secured locations. There are five plants on the ground either in operation or being set up. The oil fields are so far from the base of supplies that extra pipe and apparatus are taken. The oil districts are near ample supplies of merchantable timber. W. E. Thomas and H. R. Bradley of the Alaska M. & D. Co. are shipping north a heavy oil-boring plant for development of their 12,000 acres of oil lands, and M. A. Casey is shipping an equipment for use at Coal Oil bay.

ARIZONA.

COCHISE COUNTY.

The World's Fair mine, 1½ mile from Bisbee, has been bonded for \$200,000 to Michigan men, says the Era.

An option on a fifteen-claim group in Dixie canyon, in the Mule mountains, 4 miles north of Bisbee, for \$100,000, has been given to E. Dube, of the Lake Portage Co., operating in Gold Gulch district.

GILA COUNTY.

H. Paschal, of Chicago, Ill., a director of the Tri-Bullion S. & D. Co., owning the Starlight group of claims, near San Carlos, says it is intended to build an aerial tramway, 2000 feet in length, from the mine to Kelly's gulch, from which point there is a wagon road to San Carlos, 7½ miles. The vein opened up in the mine shows returns of 30% lead, 8 ounces silver, \$5 gold and 5% copper.

GRAHAM COUNTY.

A gasoline engine and hoisting equipment are being set up at the Sappbire mine by the Coronado M. Co., near Solomonville. They will sink a 500-foot shaft.

Two cars of copper were shipped East April 23d by the Shannon Copper Co., at Clifton, being 130,000 pounds. The concentrator is handling 300 tons of ore and the company is mining 450 tons daily. The smelter is making eighteen tons of fine copper daily.

MARICOPA COUNTY.

(Special Correspondence).—Messrs. Burson and Langley, who own claims in the White Tank mountains, have bought a 10-stamp mill, which is now being erected near the Buckeye canal, about 5 miles from their property. The ore is free-milling and averages \$20 a ton.

A large deposit of blisnuth ore is reported discovered in the eastern end of the county. The ledge is from 3 to 10 feet wide and carries from 3% to 30% blisnuth.

J. E. Maddox of Phoenix has discovered a deposit of ore in the White Tank mountains which assays \$50 gold.

Phoenix, April 28.

MOHAVE COUNTY.

Manager H. L. Pickett says the Savanic copper mines, south of the Utah line, near St. George, Utah, will be reopened this month. He has been looking into the matter of constructing a road that will connect with the San Pedro, Los Angeles & Salt Lake Railroad, which will cut the wagon haul down to 65 miles. It is 125 miles to St. George.

SANTA CRUZ COUNTY.

The Lucky Lulley Prospecting & Development Syndicate has been incorporated at Tucson (Pima county) to operate a group of mines in Tyndall district, Santa Rita mountains.—B. M. Jacobs, W. H. Barnes, F. S. Nave, A. C. Bernard, L. G. Davis, O. T. Rouse, L. H. Manning, E. J. Trippel, T. D. Satterwhite, H. Buchman, J. Knox Corbett, C. Blenman, F.

Swinnery and M. Lully of Tucson, E. J. Baker and A. T. Birl of Nogales.

The Oro Fino D. Co., that has taken over the Gold Rock Con. group at Oro Blanco, are refitting the mill building and will put in a cyanide plant.

YAVAPAI COUNTY.

(Special Correspondence).—S. E. Bretherton, superintendent Val Verde smelter, intends starting up their large furnace in a few days.

The American Copper Co. will have their 12-stamp mill ready next week. They are running three shifts in the mine. The pipe line for supplying the mill with water is nearly completed. The water will be brought from the Agua Frio river, a distance of 1½ mile. B. Blanchard is manager.

Val Verde, April 24.

(Special Correspondence).—W. A. Kent, manager of the Oriental M. Co., is running his mill one shift per day. He has been unable to get ore enough from the mine to keep the mill busy. In a few weeks he will have the 225 and 300 levels opened up, when he expects to have plenty of ore for the mill. The mine is known in the Big Bug district as the Postmaster.

Providence, April 24.

(Special Correspondence).—P. A. Johns, manager of the Braganza G. M. Co., has the tramway from the tunnel to the mill completed and is now operating twenty stamps in the mill.

Big Bug, April 24.

(Special Correspondence).—The mill of the Poland M. Co. is closed down to permit of some changes being made.

The Express mine has laid off all their men and are letting contracts for work. J. Watterson is in charge at present.

Poind, April 24.

(Special Correspondence).—The Victor M. Co. are overhauling their mill and installing new machinery. They expect to be in operation in thirty days. The mill when completed will have a capacity of eighty tons. The shaft on this property is down to the fourth level and the mine is opened to the 300-foot level; also installing hoist and other machinery. V. R. Salinger, manager; James Breslin, superintendent.

A. G. Curtis, owner of the Paystreak group, has shaft down 121 feet and tunnel in 400 feet. Ore averages \$17 per ton.

About ½ mile north of the Mudhole mine, Lynx Creek district, is the Houghton & Prescott Dev. Co., J. P. Edwards, manager, who is operating on the Sunset and Mark Twain claims. The Sunset is supposed to be a continuation of the Mudhole vein and the Mark Twain is believed to be a continuation of the Victor vein. He is sinking on the Sunset and is down to the second level; also has one shaft down 100 feet and is drifting. Has large flow of water and will put in a sinking pump. Has a 6x8 hoist on the property.

Walker, April 25.

(Special Correspondence).—Miners of Yavapai county have under advisement the putting into operation the eight-hour law passed by the recent territorial Legislature. There are many mines in this county which are in the development stage or not as yet profitable, and an attempt to make the eight-hour law operative would be resisted by mine owners and operators.

The United States Supreme Court has decided the long-continued litigation which has for over ten years past tied up the Hillside mine 50 miles west of Prescott, in favor of Lawler & Wells of Prescott.

Prescott, April 28.

Thornton & Kinsley report opening up 8 feet of gold-bearing quartz at a depth of 25 feet on their claim, 2½ miles east of Mayer.

The Peabody mine in Dragoon district, near Pearce, owned and operated by the Federal smelter at El Paso, Tex., is in full operation with seventy-five men at work. The ore carries gold and copper and is hauled to Cochise station on the Southern Pacific.

The Continental Con. M. Co. has bought the properties of the Mizona Mineral Co. and the Golden Copper Realty Co. of Mayer, the Kensington G. M. Co., the Reade C. M. Co. and other properties, including the Copper Cutlas group in Big Bug district, says the Prescott Courier. The Copper Cutlas group is near the line of the P. & E. Railroad and 20 miles from Prescott.

Articles of incorporation of the Old Mesa Gold Co. were filed at Prescott last week; E. Block, M. Goldwater, D. M. F. Weeks, A. A. Johns, M. Salzman, D. E. Daves, B. H. Gray.

The Virginia, Elizabeth and Choctaw quartz claims at Cherry Creek were sold last week to D. Drew for \$800.

The Sayer G. M. Co. has been incorporated at Chicago, Ill., to work the Leviathan group of nine claims near Mar-

tinaz, by D. J. Sayer, E. L. Hearn, P. L. McArdle, M. W. Gleason and H. J. Killilea. Development of the ore bodies will be carried out until the mines are opened up to an extent to justify the erection of a stamp mill. Water for milling purposes will be pumped 9 miles, with a lift of 400 feet, from Genung's Springs, the pumps to be run by electric power generated at the mines. O. L. Geer of Martinez is resident agent.

CALIFORNIA.

BUTTE COUNTY.

The Oroville Register says there are twenty-two dredgers in operation on the Feather river, near Oroville, and two more being built. The new ones are the El Oro and Lava Bed No. 2. There are eight on the west side of the river and fourteen on the east side.

CALAVERAS COUNTY.

(Special Correspondence).—The Melones M. Co. at Melones are driving ahead the main tunnel (1000-foot level), with one machine on each shift, making 5 feet per day. In the mill sixty stamps are dropping. The launders from the table concentrators have been rearranged so that the "middlings," instead of returning to the head of the tables, are banded by certain of the Frue vanners. The tube-and-ball mill for the cyanide plant is on the ground and the tanks and vats are all in place. The plant will be run by electricity. Distillate has been substituted for gasoline in the furnaces of the assaying laboratory, reducing the fuel cost one-half.

P. F. Woods has set up a grinding mill on the Adelaide, below the Melones mill, and will crush ore from the South Carolina, power being obtained from a 30-foot overshot water wheel.

Melones, April 27.

The Beatrice mine, near Murphys, is being put in shape for further development work, says R. E. Ober, superintendent.

The Gold Cliff mine and the Crystal mine at Angels are being operated with oil as fuel.

The Cassinelli mine at Central Hill, near San Andreas, has been bonded to T. Flint of San Juan, San Benito county, and work will begin this month.

FRESNO COUNTY.

At Coalinga, the Mercantile Crude Oil Co. has two producing wells and will put down two more on the south line of their property near the Esperanza, when they finish deepening their No. 1. The Commercial Oil Co. are planning to put down two additional wells. The Esperanza Co. will put in two and the Fresno-San Francisco Oil Co. will start No. 4.

KERN COUNTY.

The San Bernardino D. Co. are preparing to bore for oil, 8 miles from Hinkley, near Randsburg.

MARIPOSA COUNTY.

At Whitlock the Austin Group M. & M. Co. report work progressing. The Whitlock Chief tunnel has struck pay ore. The Ragan shaft is in ore. A new shaft has been started on the Golden Gate. The bunk houses, assay and general office buildings are being erected.

NEVADA COUNTY.

Articles of incorporation of the Blue Tent M. Co. were filed last week at Nevada City by C. L. Canfield, A. G. Towne, P. C. Drescher, of San Francisco; W. E. Kleinsorge, Sacramento, and C. J. Graham, Nevada City.

The Union Hill Con. mine, near Grass Valley, will resume this month, says the Tidings. The Union Con. Co. owns a group of five claims and a 10-stamp mill. Water power is used. F. Bradley of San Francisco is president and E. C. Creller, vice-president and superintendent. At present seven tributaries are at work on the surface on the croppings and on the dump. The pumps are not being run, and the shaft on the Union Hill, which is down 400 feet, is nearly filled with water.

It is locally reported the Erie mine, near Graniteville, will resume next week.

Manager Look, of the Sunflower mine, of Sacramento, says operations will resume this summer. The Sunflower is on Squirrel creek, near Grass Valley.

R. D. Plummer, interested in a group of claims at Steep Hollow, near Nevada City, says he has men at work opening up the property.

PLACER COUNTY.

The Bonnie Bee mine, at Dutch Flat, made a satisfactory clean-up last week, and the company will add five more stamps to the mill. L. W. Cummings and J. McIntyre of Alameda are directors.

Robinson & Donnelly are unwatering the Crater mine at Ophir, preparatory to development work.

Superintendent Rosenthal of the Pine

Hill mine, 14 miles north of Auburn, says he is building an assay office. The 10-stamp mill has been in operation since January 1.

PLUMAS COUNTY.

Superintendent F. E. Thomas has men at work digging a ditch and making other preparations to open up a hydraulic mine at the upper end of Elizabethtown, north of Quincy.

SAN DIEGO COUNTY.

The articles of incorporation of transfer of the holdings of the Free Gold M. Co. to the Gold Fields of California, Ltd., an English corporation, were filed last week. The property consists of thirty mines and claims (the Golden Cross group), together with a 40-stamp and a 100-stamp mill, near Hedges. The price was \$2,400,000. The company propose within six months to increase the capacity of the cyanide plant from 300 tons per day to 1000 tons.

W. W. Boswell, superintendent of the Julian Con. M. Co., near Julian, says work has resumed in the Helvetia and High Peak mines.

H. E. W. Wilson, of Los Angeles, and J. Collins, of Banner, report finding oil on one of the seven claims which they located at Fig Tree, 4 miles from Fish Springs and 18 miles southeast of Salton, Riverside county.

SANTA BARBARA COUNTY.

The de la Guerra ranch, of 2200 acres, between Careaga and Lompoc, has been sold to a company composed of Scotch and English men, with Barneson, Goodall, et al., of San Francisco, and McKay, of Santa Barbara, incorporated as the Los Angeles Oil Co. The de la Guerra ranch is surrounded on three sides by the Western Union Oil Co., and on the other by the Union Oil Co.

SANTA CLARA COUNTY.

The Phoenix Quicksilver M. Co., organized at San Francisco by A. Hayward, E. T. Newhall, J. H. Hopkins, C. A. Shurtliff and H. Stevenson, have taken over a number of quicksilver mines and mineral land in Red Mountain mining district, east of Mount Hamilton, near San Jose.

SHASTA COUNTY.

Manager M. Lindley has men at work on the May Blossom mine, near Bully Hill, near Wintrop.

J. Lanyon reports opening up 2 feet of gold quartz in his Hidden Fortune mine in Old Diggings district, near Redding, and one-third mile north of the Texas mine.

Forty men are at work at the Balaklala mine, near Kennet, and this is to be increased as development requires. Since the fire that destroyed the company's office extensive improvements have been under way. An assay office and engineers' office is under construction. The boarding house will be provided with hot and cold baths. The new bunk-house will accommodate a hundred men. In the new ore bins being constructed ore will be stored until a sufficient quantity is on hand, when a smelter will be put in. The ore is low grade, averaging from \$12 to \$18 per ton in copper, gold and silver. A large air compressor will be put in.

The machinists employed at the Iron Mountain Co.'s smelter at Keswick were ordered out on strike by their union last week, but refused to obey the call, as there was no occasion for a strike, which was intended as a retaliatory measure against the company because of the failure of the miners' strike. A large number of both union and non-union men are now at work at the mine and smelter of the Iron Mountain Co.

There are 916 men at work for the Mountain C. Co. On Monday there were 874 men at work. Tuesday morning a car containing forty-two men was switched off at the station and every one of the men entered his name on the company's roll and is now at work. There was no attempt to intimidate the new comers. As in the previous shipments these men are mostly Americans and many of them belong to unions. The machinists who were reported to have walked out on a sympathetic strike are still at work. Things at Keswick are assuming their normal, ante-strike condition.

SISKIYOU COUNTY.

An Eastern company has bought the Yreka M. & M. Co. mines in the Salmon river section, near Rollin, the Black Bear mine in same vicinity, the King Solomon mines, near Cecilville, and also the ditch of the Salmon River Hydraulic Co. at Sawyer's Bar, for supplying the power in working these mines, says the Journal.

Superintendent L. S. Williams, of the Siskiyou M. & D. Co., reports on their coal mine at Herr's ranch, between Yreka and Ager, he has the incline shaft down 825 feet. Three feet of coal are showing in

face of the tunnel. Hauling the coal up the slope was found to be an expensive method of mining, on account of the distance and the amount of water they have to contend with, and the company has decided to go into the valley below and sink a vertical shaft, which will be 200 feet deep, to strike the body of coal with depth.

SISKIYOU COUNTY.

The work of fixing up the No. 1 blue gravel mine at Greenhorn, near Yreka, since secured by J. W. Williams, is being carried on under the management of J. Garvey, and is nearly in readiness for pumping out, says the Yreka Journal. It is difficult to get wood for the engine. As soon as the electric power plants are prepared to furnish power the steam machinery will be discarded.

The Jillson quartz mine, near Hornbrook, is working and the mill running steadily. The ledge, which pinched out a year ago, has been found by prospecting.

TRINITY COUNTY.

It is reported the Brown Bear mine, at Deadwood, will close down on June 1. At present there are only twelve miners at work, and the Joker ledge, which has furnished ore for the mill for some time, is about worked out. No wood is being cut, and Superintendent Dobler declares that the mill will be running on custom rock only after that date.

TUOLUMNE COUNTY.

A \$6000 pocket is reported taken out of the Sugarman mine at Bald mountain last week. It is reported owned by J. H. Neale and leased by Herold, Smith & Watson.

Stanford & Estee have put in a heavier hoist at the Doyle ranch gravel mine on Table mountain, near Sonora. O. Doyle is superintendent.

E. S. Root has a bond for a deed on the Never Sweat claim, near Sonora, for \$2000.

W. A. Swerer of Tuttle town has bought the interest of M. F. Swerer in the Swerer Bros. quartz mine and mill, near Tuttle town.

W. Sharwood has bought a one-third interest in the Georgiana quartz mine, adjoining the New Albany south extension, formerly the Garfield mine, near Carters.

J. S. Raggle has bought the Golden Annie quartz mine on the main Tuolumne river, near the mouth of Big creek, near Big Oak Flat.

The Vine Spring mine has been sold to the Yankee Hill G. M. Co. for \$5000 cash, it having been under bond to that company. The mine is near Columbia.

R. C. Davis has bought of J. F. Newcomer a half interest in the Newcomer mine, being subject to a bond held by D. Copella; also a 2-stamp quartz mill and all machinery, water rights and mill site on Knights creek, near Sonora.

The Goldwin mine, on the North Fork of the Tuolumne river, near Carters, is down 612 feet, and, pending the arrival of heavier machinery, only a few men are at work in the mine on the 300 and 500 levels. There is a 10-stamp mill on the property. The new hoist will be capable of sinking 500 feet deeper.

YUBA COUNTY.

The Fortuna M. Co. has bought 420 acres of placer mining land near Bullard's Bar, there being twenty-one claims in the original locations. Boring, drifting and other development work has been done and will be continued.

COLORADO.

BOULDER COUNTY.

R. G. Mullen, manager of the Montgomery G. M. & R. Co., at Puzzler, and F. R. Jeggery, of Colorado Springs, superintendent, say the cyanide tests on their ores have been satisfactory, and the plant will be built. The Montgomery group consists of several claims near Puzzler, in Ward district.

A body of nickeliferous pyrrhotite at the head of Long gulch is being developed by the Wellington Co., near Wall Street, who are pushing this work. A tunnel is being driven in from the gulch and will cut the ore at depth of 200 feet. A width of 25 feet of ore at a depth of 50 feet is shown in the upper workings.

CLEAR CREEK CO.

At the Little Clara mine, near Yankee, owned and operated by Hawks Bros., at a depth of 55 feet a 2-foot pay shoot has been opened up, assaying \$150. The Gold Anchor is saving four-ounce ore and four carloads are ready for shipment. They are drifting at 115 feet.

Work has been resumed in the Burns-Moore tunnel at Idaho Springs and will be extended to the 2000-foot point, 800 feet having been driven. J. M. Shaller & Co., of Denver, are the owners and operators. The International M. Co., operating the Little Six group in Georgia gulch and the

Bull Moose group at the head of Virginia canyon, have taken a lease and bond on the Remington mine, 1 mile up Virginia canyon from Idaho Springs, in Seaton mountain section. Superintendent O'Neill says he will drive the main tunnel ahead on the vein.

Manager Robeson says the drift on the Phillips lode in the Burleigh tunnel, near Silver Plume, is being advanced both east and west from the tunnel, and 600 feet of ground has been drifted through, showing a streak of ore 12 inches in width with values in lead.

FREMONT COUNTY.

Two more oil companies have been organized to exploit a portion of the Florence oil field—the Castle Rock Oil Co. owning deeded rights to 1500 acres of ground, north of Florence, across the Arkansas river—J. A. Milner, J. A. Patterson, A. W. Lucas, C. W. Lucas and W. M. Helm; and the West Lebanon Oil Co.

The Keystone Oil Co. well No. 5, near Florence, is yielding 150 barrels of oil per day. It has been decided to drill another well. T. M. James is president and manager.

The Empire Zinc Co., south of Canon City, has doubled its capacity. The magnetic dry process is used, and they have put in five additional separators. There are sixty men on the payroll. Most of their ore comes from Leadville. They have 28,000 tons of ore on the ground ready to mill.

GILPIN COUNTY.

The Four-Mile Gulch Tunnel M. Co. is operating the Bryan and Wheeler groups in Dory Hill section of Enterprise district, near Central City, and has opened up ore in both the Bryan and Wheeler tunnels. The Bryan tunnel is in 1010 feet, showing a 3½ foot vein, with 18 inches of silver-lead ore assaying \$63 per ton. The Wheeler tunnel is in 560 feet. Two winzes are being sunk below the tunnel level and both are in ore. The company will also resume operations on the Democrat, erect a shaft building and put in a 16 H. P. gasoline hoisting engine. This shaft is down 100 feet and will be sunk to 500 feet, which will make connections with the Bryan tunnel. J. Brohl is superintendent.

Wilkesbarre, Pa., parties have organized the Wilkesbarre M. & M. Co. and have bought the Blind Girl and Sick Dutchman lodes, a one-half interest in the Dark Horse claim, and taken a lease and bond on the Baldwin and West Baldwin lodes, all near Russell Gulch. The shaft building is completed on the Baldwin shaft, which will be made the main working shaft of the group, and a 12 H. P. gasoline hoist set up. This shaft is down 120 feet and is being cleaned out and re-timbered. There is a tunnel cutting this shaft at a depth of 80 feet, which provides ventilation. J. F. Harrington is superintendent.

W. Mitchell & Sons are sinking on their Gulch claim in Lake district, near Central City, and are down 150 feet. They expect to replace the whim with a hoisting plant.

The Russell Gulch M. & D. Co. are unwatering the Rocky Mountain Terror mine near Russell Gulch. The shaft is 450 feet in depth.

An air compressor has been put in at the Buell mine, of the Gregory-Buell Con. G. M. & M. Co., near Central City, and work started on a contract of 1000 feet of machine drifting and stoping. The mine will be developed so that by the time the mill is completed there will be ample supply of ore. The Gregory mine is making regular shipments to the stamp mill and smelting ore to the sampler. All hoisting is to be carried on through the Buell shaft.

GUNNISON COUNTY.

The Porcupine group of five claims on South Gold hill, near Tin Cup, is sold to Waterbury & Adams of Denver for \$9000. The Porcupine tunnel is in 1100 feet, and at 450 feet from the south entrance a 4-foot vein was cut which averages \$8 in gold and silver; at 150 feet farther a 12-foot vein was struck which runs 5% copper, \$2 in gold and silver. A shaft of 120 feet also shows a vein which carries 4½% copper, seven ounces in silver and \$2 in gold.

In Taylor Park section, near Tin Cup, the Woods G. M. Co. of Kansas City has been incorporated and secured sixteen lode claims on Jenkins mountain. A tunnel is in 200 feet and showing ore 12 feet across, averaging \$15 per ton in gold. It is free milling. The vein has been opened for 1000 feet by shafts and tunnels. The company has bought a 100-ton mill. J. Lynch of Tin Cup is superintendent.

HINSDALE COUNTY.

The Tobasco G. M. & M. Co. of Lake City, which is operating in Burrows park, propose to resume operations at both mine and mill next week, says President J. Martin.

LAKE COUNTY.

The Belgian-Frenchman M. Co. was incorporated last week to operate the Belgian and Frenchman mines, on Iron hill, Leadville. To furnish drainage, an arrangement will be made with the Yak tunnel for driving a lateral into the property. If desired, this lateral can also furnish transportation facilities at about one-half the cost of hoisting to the surface. The directors are A. D. Dickinson, J. L. Wright, L. R. Johnson, J. H. Stotesbury, G. F. Burtch. J. H. Stotesbury is manager.

The principal producing mines at Leadville are the Moyer, 300 tons per day, Ibox 300, Small Hopes 200, Home M. Co. 225, Fryer Hill 250, Caribou 100, Sixth Street 100, Resurrection 150, A. M. W. 150, Midas 150, Yak 150, and a number of others that are producing from thirty to sixty tons a day. The zinc tonnage of the district is 200 tons daily.

The April output of Leadville is expected to show a considerable tonnage of manganese ores, due to the demand from the Pueblo steel works. Most of this ore is coming from the Sixth Street, Catalpa-Crescent, Yankee Doodle and Crofton mines. The demand for oxidized iron continues.

SAN JUAN COUNTY.

Work was resumed last week at the King mine, on Sultan mountain, near Silverton, after a shutdown of several months. The 1000-foot tunnel is being extended to cut the King vein and is now 300 feet ahead, says Manager Pyke. Drifting will begin on the King vein. Twelve men are at work. It is the intention of the company owning the Cleveland mine, on Sultan mountain, 3½ miles down the Animas canyon, to put in a compressor and cut the vein by tunnel. The Cleveland is below the King mines, on the same vein system.

After three months' pumping, the unwatering of the North Star mine on Sultan mountain, near Silverton, was finished and drifting on the vein at the bottom of the 110-foot shaft has begun.

Final payment for the Hazlett interest in the Tom Turner group of claims, and the Florence millsite, above Gladstone, has been made by the Gold Queen M. Co. The directors of the company are G. W. Crawford, W. E. Bridgman, H. Riddle, H. J. Hayham, J. T. Richards and W. P. Mallon.

The Silver Queen mine, in Mastodon gulch, near Silverton, reports making another strike, opening up a streak of lead-copper ore which carries gold values. Superintendent J. James says the strike was made on the midway vein by a crosscut from the main tunnel, which was run 250 feet. This crosscut will give the company 200 feet of stoping ground and 350 feet to the surface workings.

Manager H. S. Born of the Little Maud group at the head of Maggie gulch, near Silverton, says work will be resumed next week. Last season shipments of smelting ore were made. New workings will be started and a crosscut tunnel run to tap the veins at greater depth.

The Monte Vista claim in Maggie gulch, near Silverton, will begin operations next week. C. A. Johnson of Durango has bought a one-third interest in this claim and holds an option on another one-third for \$5000. There is a tunnel in 75 feet which cuts the vein at a depth of 56 feet, showing a body of milling ore 6 feet wide, carrying gold values. Some sylvanite is found in the vein.

TELLER COUNTY.

L. D. McMullen, holding a lease on the Alexander Marsh claim on Raven hill, at Cripple Creek, owned by the Amethyst G. M. Co., has resumed operations. The shaft is down 100 feet and will be deepened to 180 feet before starting lateral work.

F. A. Wright, manager of the Lincoln M. & M. Co. mines on Lincoln hill, near Gillett, with Eastern men has been granted a lease on the Hoosier properties on Tenderfoot hill, Cripple Creek, for thirty months. The main shaft has been sunk to 488 feet and will go 300 feet deeper. There is also an incline shaft of 300 feet. A crosscut will be driven northeast from the 400-foot point in the main shaft.

A compressor is being set up on the New Haven mine on Raven hill, Cripple Creek, by a leasing company composed of Victor men.

The Jupiter P., M. & M., Ten Diamonds and Venue lodes have been sold to a New York company in which are interested P. M. Egert, R. J. Meredith, G. A. Jepsen and S. T. Kane, of Holland Patent, N. Y. The four claims, which are in Lexington district, near Idaho Springs, have a tunnel driven 200 feet.

The appropriations being insufficient to complete the second geological survey of Cripple Creek district by the U. S. Geological Survey, the mine owners and operators of Cripple Creek and Colorado Springs mining men have contributed

liberally to raise funds with which to finish the work.

The Kaffirs G. M. Co. have granted a lease for two years to C. S. Page & Co. on the New Turn and May Brewin claims, near Cripple Creek, on a 20% royalty. The Kaffirs Co. owns fourteen acres on Squaw mountain. The shaft on the New Turn is down 65 feet. The vein which has been uncovered at the surface is known as Squaw Mountain vein No. 4, and farther up the hill has shown values.

Sinking in the main shaft of the Rocky Mountain Leasing Co., operating on the south half of the Delmonico, on Bull hill, at Cripple Creek, has been suspended pending the result of investigations in progress on the Olive shaft, north on the same property, where the Rocky Mountain Co. is driving a crosscut to determine if the shoot found in the main workings extends into depth. On the 150-foot level of the main workings a vein was opened that has yielded ore of varying quality during the last three months. The body is 3 feet wide and 40 feet long, and runs \$30 in gold to the ton, but there is a streak within it that assays \$600 to the ton when sorted. This body has been worked from the floor of the drift to the surface.

Hadley & Frizzell have put up an experimental cyanide plant on the Fluorine claim, north of Cripple Creek.

At the Sitting Bull mine, on the northeast slope of Battle mountain, near Cripple Creek, the ore body is opened up by lessees at a depth of 225 feet, and they have drifted on the shoot for 100 feet, showing an average width of 3 feet of smelting ore. Along the hanging wall there is a streak 6 inches wide running \$300 a ton.

The Elkton Con. M. Co. at Cripple Creek has granted a year's extension of the lease on the Tornado mine to W. H. Clements. Shipments average seven carloads of ore each month, all of smelting grade.

The Colorado Springs Telegraph says the failure of Stratton's Independence Co. at Cripple Creek to prospect the 1400-foot level of its property is explained by J. H. Hammond, consulting engineer, in a report made to the London officials, in which he states the volume of water at that depth interfered with operations. This condition will be obviated by increased boiler power, which will be devoted to pumping. Stopable ore has been opened on the Emerson vein on the 960 and 1050 levels. This is the lowest depth at which the Emerson vein carries pay ore as far as developments extend. Manager Cornish will increase the boiler capacity at cost of \$10,000.

On Copper mountain, near Cripple Creek, the Fort Wilcox Co. have driven a tunnel 900 feet, but at present they are following a vein, which has been found in the Fluorine. A crosscut was driven into the Fluorine at a point 700 feet from the portal of the Fort Wilcox tunnel. This crosscut has been extended 200 feet. Two air drills are used. Two shipments were made last week, one each from the Fort Wilcox and Fluorine claims. This ore is low grade.

It is reported a strike has been made in the Lincoln mine, a mile west of Gillett, showing at a depth of 600 feet a vein 4 feet wide, which gives \$70 gold per ton.

Shipments of ore have been started from Carbonate hill, near Cripple Creek, the new shipper being the Buckhorn claim, operated under lease by Wiley, Emmert & Chase. The shaft is down 100 feet. They have opened and prospected two veins, one northeast by southwest and an east and west vein, and at the juncture of the two veins they are breaking 20 inches of ore that runs \$40 gold per ton.

The Rhyolite Beacon M. Co., composed of local men, has organized at Cripple Creek, with E. E. Miller as manager, to operate on Rhyolite mountain, near Cripple Creek. The company owns nineteen and one-third acres surface area and has twelve additional acres of underground rights, also a group on Rose Bud hill. There is a shaft down 60 feet on the Rhyolite, which will be continued.

J. E. Smith, having a bond and lease on the Brigadier mine on Raven hill, Cripple Creek, began ore shipments last week. He also has a lease on a block of the Abe Lincoln and on the Ida May.

The Princess Alice Con. G. M. Co. at Cripple Creek have bought control of the Bonnie Nell Co. for \$75,000, and have bought the Abe Lincoln claim, containing five acres, for \$30,000.

IDAHO.

BANNOCK COUNTY.

The Scott G. M. Co. has incorporated at Deseret, Utah, by C. J. Thomas, H. Duncan, D. T. Duncan, to work the Tipover, Mary Jane, Conglomerate and Carbonate Hill lode claims, near Pocatello.

CASSIA COUNTY.

Development work has resumed on the Golden Eagle mine, 10 miles south of Al-

blon, which is owned by S. P. Weatherman of Pocatello and O. H. Melcher of Albion.

CUSTER COUNTY.

R. Macbeth has bonded the interests of W. T. Oster and A. C. Allen in the Shakespeare mining claim on Loon creek, near Mackay, for \$7500. The Shakespeare joins the Lost Packer on the east.

IDAHO COUNTY.

The Champion group of mines in Elk City district were sold recently to the Thunder Mountain G. M. Co. of Philadelphia, Pa. The group consists of nine claims on Crooked river, 9 miles from Elk City. A tunnel is in 140 feet, giving a depth of 100 feet; the ledge is 5 feet wide and average assays run \$15 in gold. The ore is free milling. As soon as the roads are in shape the company will ship in a 10-stamp mill.

The United Gold Ledge M. Co. of Idaho has been organized by New York and Chicago men under Arizona laws, with headquarters at Chicago, Ill., to operate in Thunder Mountain district, near Roosevelt. G. W. Dorgey is president. They have a number of properties in Thunder Mountain district, also in Big Creek district. They bought a group of claims on Smith creek, a group on Fall creek, near the Dewey mine, also a group of six claims near the Fairview. T. Van Meter of Welser is superintendent.

KOOTENAI COUNTY.

G. H. Clarke of Spokane, Wash., part owner of the Josephine group in Metaline district, has resumed work. The shaft will be sunk and a crosscut driven. At depth of 50 feet the ledge is 50 feet wide, with average assay values of 20% in lead and some silver. The camp has heretofore been hindered by insufficient transportation facilities, boats being unable to get through the Box canyon. There is money now available from the Government appropriations for the improvement of the Pend d'Oreille river. With an open waterway the freight rates will be reduced.

OWYHEE COUNTY.

F. G. Clark of Salt Lake City, Utah, superintendent of the Palmer-Holland groups on Florida mountain, near Silver City, has started work on these mines, which have been sold to the Trade Dollar Extension M. Co. of Salt Lake. W. C. Orem is manager. He will first run a tunnel to cut the Holland mine 100 feet deeper than the point where the ore was taken out by the lessees last fall. It is then proposed to open the properties by a tunnel from a point near Jordan creek, below Black Rock gulch.

SHOSHONE COUNTY.

W. Mather and N. McDougall are hydraulicking in American gulch, near Delta. Adjoining American gulch is Montana gulch. There is a mile of flume and ditch, by which water is brought from Potosi. There has been so much water in Potosi creek that Kingman & McDougall have been unable to drift on their placer ground, which yields \$5 to the set. Coulson & Heustis have put their Trail creek placer property into working order and started booming. They report finding it 20 feet to bedrock, and the entire amount of sand, clay and gravel above bedrock will be moved by the use of the boom. W. Gilliland is running his boom on upper Trail. He reports the grade of gold next to the hill is better than that in the middle of the old channel. The dredger on Lower Beaver, on the Pritchard ground, is running. A. M. Hill, owning the Roy group of claims on Upper Beaver, is doing work in the south tunnel in the direction of the Toughnut. He will drive 400 feet, a total of 1000 feet.

The litigation between the Yolande M. Co. and the Gold Hunter M. & S. Co., operating adjoining claims at Mullan, has been settled by the Yolande M. Co. deeding all of its rights to Larson & Greenough of the Morning mine (who were also interested in the Yolande) for \$20,000. The entire Yolande property was turned over to the Hunter Co. for \$38,000. The Yolande was being worked through the Hunter, and it was claimed that nearly all the high-grade ore which was being taken out was coming from the Yolande, and an injunction was served on the Hunter to keep them from taking out more ore from that ground. The Hunter group consists of eleven full claims, four millsites and two water rights.

The Moonlight M. Co., operating eight claims above Burke, filed articles of incorporation last week; J. Murphy, W. H. Smith, E. Hedin, J. and P. Kennedy, P. Lambert, F. Stroh of Burke and C. H. Betts of Wallace. Drifting and tunneling have been done.

MICHIGAN.

Lake navigation was reopened last week, the first shipment going from Dol-

lar Bay, the Osceola taking a cargo of copper wire from the mills there. The Calumet & Hecla shipments have begun from Portago Lake docks.

EMMET COUNTY.

The conglomerate in the Porcupine Mountain district, near Carp Lake, has been located. For twenty-five years samples of rich conglomerate have been found there, all being float copper, however. The lode is now reported found in the south or porphyritic range, whereas all former search had been confined to the north range, or the Carp Lake sandstone formation.

HOUGHTON COUNTY.

Improvements are being made on the plant of the Lake Superior Concentrating Co., which is operating on the Franklin sands, near Hancock. An engine has been placed which will develop 240 H. P. for driving the washing machinery.

The automatic stokers at the Champion, near Houghton, are in operation.

The strike of the trammers at the Wolverine mine, near Hancock, resulted in the return from Arizona of Superintendent Smith last week, and those who had accepted the offer of the assistant superintendent of \$56 per month (the same as paid at the North Kearsarge) immediately asked for another advance to \$58. This was refused and the men went out. The entire mine is tied up and the miners have been notified that operations will cease until the trammers return. The miners are not in sympathy with the strike.

The work of removing No. 2 shaft and rockhouse from the Arcadian to the Tri-mountain No. 4 shaft, near Hancock, began last week. The structure is of steel. The Douglass shaft is the only one that is being worked at the Arcadian. The steel shaft house still remaining at No. 1 shaft may eventually follow the others to Tri-mountain. The third head of the mill is stamping rock.

The Red Jacket shaft of the Calumet & Hecla at Calumet is shipping 650 tons of ore daily. The output will be increased during the year by changes in hoisting methods.

KEWEENAW COUNTY.

The engine and boiler equipment for sinking the Allouez shaft on the Kearsarge lode, near Allouez, is being set up. The Ahmeek crosscut to the lode is expected to strike the latter this week.

ONTONAGON COUNTY.

The management of the Michigan mine has contracted with the Mass for the use of one head at the Mass mill, at Mass City, for six months. The Michigan will begin sending rock over the Mineral Range road as soon as 2½ miles of track can be laid to the mine.

Superintendent Brady of the Michigan mine, near Mass City, says sinking at "B" shaft has reached the thirteenth level, which, from appearances, is 50 feet below the point of contact of the Branch and Minnesota veins. The bottom openings of the Branch vein are producing mass copper. The contact of the two veins is expected to be reached next week. Foundations for the shaft and buildings are finished and the new hoist for "A" shaft is on the ground.

The remodeling of the Adventure mill, near Mass City, by the original contractors to make good the defects in the first construction has been completed, and all three heads are in operation. The mineral yield is reported improving.

The location of the Baltic lode on section 16, owned by the Atlantic M. Co., near Houghton, is said to be still in doubt. The vein may be among those cut by the crosscut, but, if so, was not recognized, and it is thought the solution of this problem is in the extension of one of the Baltic drifts north of No. 5 shaft to the Atlantic group.

MONTANA.

CARBON COUNTY.

The Bear Tooth Coal Co. has been incorporated by Red Lodge men to exploit the coal measures near Red Lodge, which the company has leased.

CASCADE COUNTY.

Butte advises report the Montana Coal & Coke Co., near Belt, is operating 240 ovens; that its receipts have increased from \$650 to \$1000 per day. The washer is working satisfactorily and the company has an ample supply of water.

CHOTEAU COUNTY.

Oil is reported 25 miles from Havre by J. C. Griffin.

CUSTER COUNTY.

L. Eaves, of Butte, who has a lease and bond on the Southern Cross mine, near Georgetown, says he is putting in machinery. The Southern Cross is owned principally by H. L. Frank of Butte.

DEER LODGE COUNTY.

A smelter is to be erected in the Moose Lake district, near Anaconda, says J. J. McCaffrey, manager of the Moose Lake Smolting Co.

FERGUS COUNTY.

The New Mine Sapphire Co. has bought the Baker, Snowdrift, Clayburg, Gunn and Hoover sapphire claims in Yogo district, near Lewiston, says the Argus.

Manager H. J. Kendall of the Kendall mill, at North Moccasin, near Lewiston, says they have put in an electric elevator belt which solves the problem of removing the tailings from the mill. The tailings had piled up several feet in the gulch until they reached a point on a level with the troughs through which they were conveyed from the solution tanks. The plan is to dump them from an elevation of 20 feet. The elevator belt carries them from a tank in which they are washed from the solution, to a trough at the elevation above mentioned, through which they flow a safe distance from the mill into the gulch.

FLATHEAD COUNTY.

There will be at least three oil companies sinking wells in the Kintla Lake fields, near Belton, this season, says the Inter-Mountain. Butte Oil Co., Kintla Lake Oil Co., and the Pacific Oil Co., the last named being composed of Kallispell parties. The Butte Co. have a well down to a depth of 1100 feet.

GALLATIN COUNTY.

The Bozeman Onyx Co., organized last week at Bozeman, O. P. and C. Chisholm and R. D. Chisholm. This company owns eighty acres of land 4 miles north of Manhattan, on which is located a deposit of onyx, and development work will begin this month. A road will be built from the property to Manhattan to facilitate hauling in machinery.

GRANITE COUNTY.

The Montana G. M. Co., operating the Sunday mine at Royal, last week shipped its regular weekly bar of gold to the U. S. assay office at Helena. The bar was valued at \$3700 and was the result of a week's run of a five-ton Huntington mill.

LEWIS AND CLARKE COUNTY.

The Golconda G. M. Co. has been incorporated by Chicago, Ill., and Helena men, to work the Golconda group in Jay Gould district, which adjoins the Jay Gould and Homestake mines. There are 3000 feet of tunnel and laterals and a 10 stamp mill. Development will be pushed with a view of operating the mill this season. The company will erect a cyanide plant.

W. Parker is preparing to resume dredging operations at the head of Alder gulch, near Marysville, by May 15.

PARK COUNTY.

The reorganization of the Bear Gulch and Revenue properties at Jardine (the Kimberly-Montana M. Co.) has started the Revenue 40-stamp mill, and men have been put to work in the mines. The cyanide plant being built in connection with the new stamp mill is nearly ready to work on the tailings from the mills.

SILVER BOW COUNTY.

The Kendall Chronicle says F. A. Heinze is working two mines at Butte, the Rarus and the Cora. The former is said to be yielding 1000 tons of 6% copper ore daily and the latter 500 tons per day. The ore of the Cora runs 4% copper and some silver. There is also some silver in the ore of the Rarus. With the exception of the first-class grade, all of the product of the two mines is sent to the concentrator at Basin, where it is run through the crushing and concentrating machinery and then returned to the smelter. The ore of the Rarus averaged only 3% in copper for some time, but the grade was increased by adding some of the richer ore, a shoot of which each of the veins contains.

The Emma mine at Butte has closed down for the present.

NEVADA.

ELKO COUNTY.

Superintendent W. D. Higginson of the White Rocks placers, near Elko, says work was started this week.

EUREKA COUNTY.

F. L. Hook, of Salt Lake City, Utah, has bought a one-third interest in a group of copper mines near Eureka, owned by J. A. Hunt, H. Kohn and E. B. Johnson. The group consists of eight lode claims and two water locations on the east side of Diamond valley. A tunnel is being driven.

LINCOLN COUNTY.

B. F. Lewis of Los Angeles, Cal., manager of the Parallel G. M. Co., operating near Searchlight, says development work

will be increased on their group, which consists of four claims. So far most of the work has been done on the Elvira and the Birdie. A contract has been let for drifting on the 100-foot level of the Elvira and to sink the shaft down to the 200-foot level.

V. A. Macdonald of the Providence Exploration and Development Co. of Providence, R. I., says his company has bonded the Howard-O'Connor group at Newberry, near Searchlight.

Manager Lane of the Horseshoe mine at Fay says machinery is being set up and operations are expected to resume May 15.

NYE COUNTY.

The Ordah-Tonopah M. Co. has been organized, with C. E. Watson as manager, and owns seven claims 1 mile south of the Mizpah at Tonopah. It is intended to sink a shaft on the Wonder claim.

A steel gallows-frame, 65 feet high, is being constructed at the Slebert shaft by the Tonopah M. Co., at Tonopah, and is expected to be ready for operation next week. Plans for the reduction works are being perfected. The station at the 700-foot level of the Slebert has been cut and the crosscut started.

A. L. Hudgens, owning a one-fourth interest in the Bennett group of eleven claims adjoining the Hasbrouck group on the east, at Gold Mountain, near Butler, made the first payment last week on the purchase price of \$30,000 for three-fourths of their three-fourths interest. The Millbrae M. Co. has been formed to work the property. F. D. Neckerbocker is superintendent and manager.

At the Boston Tonopah, at Tonopah, the machinery is in place, including a 50 H. P. steam hoist and a 5 H. P. gasoline engine for running the blower.

The Halifax shaft, at Tonopah, is down 500 feet, and at 600 feet they will start crosscutting both north and south.

STOREY COUNTY.

The shaft buildings and gallows frame at the New Forman shaft, at Gold Hill, were totally destroyed by fire on April 21st. After burning an hour the gallows frame fell into the shaft and set the timbering on fire. This will probably cause the most serious loss, as this shaft was used to ventilate the south-end mines, and if it caves, air for that section will be shut off. The origin of the fire is unknown. The building was one of the most expensive of the hoist plants on the Comstock, and could not be duplicated for \$50,000, says the Journal. A hoist engine and pump were also in the wreck.

WASHOE COUNTY.

At Olinghouse, near Wadsworth, the Slip mill began crushing ore last week. The Jumper has twenty tons of ore sacked and in the bin, and has started an upraise from the 150-foot level.

WHITE PINE COUNTY.

It is reported P. H. Cannon & Co. will erect a 20 stamp mill at the Exchequer mine at Cherry Creek.

Machinery for the Fortuna Grande C. Co., operating the mines at Pilot Knob, near Ely, is on the ground, including a 60 H. P. boiler, a hoisting engine, a pump with 7-inch discharge, 300 feet of 7-inch pipe and several hundred feet of 4-inch steam pipe, all of which will be placed at the Giroux shaft of the Old Glory. When these are in place the shaft, down 350 feet, will be sunk to the 600-foot mark.

NEW MEXICO.

GRANT COUNTY.

H. C. Begole and J. C. Boyd of St. Louis, Mo., having an option on the Ashton and Roach mines (the Wildcat group) at Santa Rita, began operations this week. The mine will be developed by sinking the double-compartment shaft to a depth of 500 feet and connecting with the ore body by drifts. The mill will be overhauled, the Huntingtons removed and two additional rollers with screens put in. The floor space will be increased and several concentrating tables added.

The National G. & S. M. Co., operating at Stein's Pass, propose to erect a concentrating plant.

The main shaft of the Aberdeen, near Lordsburg, is being timbered its entire 300 feet. When this is completed a pump will be put in and a crosscut driven to the vein.

M'KINLEY COUNTY.

The Weaver coal mine at Gallup last month produced 40,000 tons of coal.

RIO ARRIBA COUNTY.

Frank Bros. of Denver, Colo., are boring for oil in the gulch below the Coyote coal fields on the Santa Fe Central Railway, near Coyote. They are down 900 feet.

In Bromide district, 15 miles west from Tres Piedras, on the Antonito-Santa Fe branch of the Denver & Rio Grande Rail-

road, and 25 miles south of the Colorado State line, the Nahama Leasing Co. of Creede, Colo., are operating on the Bromide mine.—The Tampa mine is being worked by the Tusas Peak G. & C. Co., and they have a 12-foot vein, 6 feet of which is shipping ore. The Tampa is on the north slope of Tusas peak, near Cunningham gulch, Bromide district, and the shaft is being sunk below the 150-foot level, the vein being opened up by crosscuts and drifts at the 50, 100 and 150-foot levels. The company has bought a mill-site on Las Tusas creek and will build a mill this summer.—The War Eagle, owned by the Mexican King G. & C. M. Co. of Milwaukee, Wis., near the Tampa, has opened up at the 60-foot level a 4-foot vein of copper sulphides, assaying 15% copper. The shaft is being sunk.—The Continental is taking out galena, with silver values of forty ounces per ton.—The Copper mountain tunnel site, controlled by the Pontiac M. Co., on Kiowa mountain, has a tunnel in 400 feet, with 100 feet of drifting on the vein, which shows a large body of ore carrying 4% copper.—Other companies operating in Bromide district are the Lady Gay group, the Copper King (owned by the Anaconda-Eureka M. Co.), the Strawberry group, the Princess group, Payroll and the Whale (owned by the Belle Royal M. Co., who are putting in a steam plant of machinery).

SIERRA COUNTY.

A strike of gold ore, running \$100 to the ton, is reported made in the south 100-foot level on the Log Cabin at Tierra Blanca.—The South Percha M. & M. Co. report opening up ore on the Great Eastern on the South Percha. The property is crossed by two leads running parallel to and 60 feet apart. The tunnel being run on the Stuck lead is in 190 feet and showing both milling and concentrating ore. A crosscut has been started to tap the other (the Mosey) lead.

C. M. Root & Co. have bonded the Happy Jack mine, at Andrews. There is a supply of ore on the dump and the Andrews mill has been leased.

A. H. Hilton has bought 800 acres of coal lands at Carthage. There are three developed mines on the property and shipments are being made.

OREGON.

BAKER COUNTY.

F. D. Smith, managing director of the Oregon Mines & Exploration Co., operating the Snow Creek mines in Greenhorn district, near Sumpter, says the vein on the west 70-foot level was crosscut last week, showing a width of 8 feet in ore, assaying \$60 a ton. A stringer of 12 inches from the main ledge of high-grade ore was struck. Drifting on the ledge and blocking out ore preparatory to the installation of a mill is under way. The mill will be built this summer.

The Bear Gulch placers operated by the Hobson Mercantile Co. of Sumpter started up last week, says the Miner. The Hobson Co. has quartz prospects on Deer creek which are also to be worked this season.

The owners of the Morning mine—Ames, Cooper & Simmons—are building a mill at their mine near Sumpter.

The Midway mine, near Sumpter, is to have a hoist, says the Miner, with a capacity for sinking to a depth of 1000 feet. A compressor will also be put in, and steam capacity to operate both. It was found in crosscutting the lode that little depth was being gained, and that a deeper tunnel on that part of the ground would be too expensive, so much so that a sinking plant was decided on. The hoist will raise 6000 pounds 1000 feet in a minute.

A. Geiser, superintendent of the Midway M. Co., in Cracker Creek district, near Sumpter, says a 4-drill air compressor, a 125 H. P. boiler, feed pumps, an electric lighting plant for the mines, a cylinder hoisting plant with a capacity of 1500 feet depth, together with accessory machinery, will be ordered and installed this spring. At the Gold Pan on Huckleberry mountain, of which Geiser is also superintendent, a hoisting plant with a capacity for 500 feet depth is being set up.

CLACKAMAS COUNTY.

F. C. Barstow reports finding coal on his claims near Wilhot Springs, 25 miles east of Oregon City, in the foothills of the Cascade mountains.

GRANT COUNTY.

It is reported that the management has decided not to build a tram from the Bull of the Woods shaft to the Badger concentrator, as previously planned, but will put up a separate and independent mill, as development work has shown an increase of values.

W. C. Rutter of Seattle, Wash., president of the Klitting M. Co., operating near Granite, says development work on

the Big Four group continues and final payment has been made. It is expected to put up a mill this summer. G. J. Barrett is manager.

The Prairie City Miner reports cobalt ore found in the mines of Toner & Walling, owning an extension of the Copperopolis.

SOUTH DAKOTA.

CUSTER COUNTY.

A vein has been discovered on the Granite Reef, 3 miles from Custer. J. Demereau struck the vein while doing assessment work. The vein is 6 feet wide, cutting the formation at right angles.

LAWRENCE COUNTY.

(Special Correspondence).—The tin mines at Tinton, on Nigger hill, are being developed with good prospects. The tin ledges in this region are large, from 10 feet to 100 feet or more in width, and carry cassiterite and some of them gold. A great deal of development work has already been done. In the early summer the Tinton company will build a concentrating mill of 100 tons capacity. M. H. Lyon is superintendent.

Tinton, April 24.

Lundberg & Dorr and A. D. Wilson have bought the Buxton mines in Bald Mountain district, 4 miles south of Lead City. The Buxton and Bonanza properties have been worked under lease by Lundberg & Dorr for several years. The deal includes the Cheator, Chlorinda, Pluto group, north of the Golden Reward mines. A cyanide plant will be built and the ore will be carried by gravity tramway from mines to mill.

A strike of ore of good grade in the quartzite level of the Cleopatra mine on Squaw creek is reported. The shaft some time ago encountered the lower quartzite and crosscuts have been driven east and west. The company will resume operations with the cyanide plant.

PENNINGTON COUNTY.

The Burlington M. Co. has been organized at Deadwood. They have bought the York and Crain groups of claims in Friday Gulch district, northwest of Hill City; J. L. Bently, N. T. Mason, A. Hattenbach, H. S. Vincent, W. S. Elder, J. W. Taylor, C. Miller. There are 118 acres of the ground and some development work has been done. It is at the head of Friday gulch, covering a portion of the Rochford placer belt. They will work both the placer and ledge deposits.

The Columbia G. M. & M. Co. has completed a \$7000 plant at the mine near Rochford, and sinking has resumed in the shaft, which will go to a depth of 200 feet, when crosscutting will begin. The plant consists of a steam hoist, 100 H. P. boiler, air compressor, drills and plant for electric lighting. Developments at the Golden West continue encouraging. The main shaft is being sunk below the 100-foot level, and another station will be cut and a crosscut driven to the vein. The company has a sawmill at work on the property, turning out lumber for buildings.

TEXAS.

EL PASO COUNTY.

Manager Morehead reports tin ore on his group, 12 miles from El Paso and 6 miles from the railroad. It assayed 15%.

UTAH.

BEAVER COUNTY.

C. Baxter, manager and part owner of the Kitty Clough mine, near Milford, reports a strike made on the 100-foot level showing a 3-foot vein of gold-bearing iron, averaging \$17 in gold per ton. The Kitty Clough adjoins the Vicksburg group of the Majestic Co.

At the Old Hickory mine of the Majestic Co. at Milford the electric drill plant is being put up, including a 20 H. P. gasoline engine and 22 H. P. dynamo. The shaft and tunnel are being wired. The working shaft is down 200 feet and the tunnel is in 220 feet, with some distance yet to drive to strike the shaft.

A. B. Lewis last week bought the Campbell estate's interest in the Monitor, Red Warrior and Florence groups, in Star district, near Milford, says the Milford Times, for \$55,000. It is reported the Atlas group has been added to the company's holdings. C. H. Smith, at the Copper Mountain, reports the hoist being placed. Material for the smelter is on the ground. Contractor Halterman has struck water in the artesian well at the smelter, at a depth of 470 feet. The flow at the surface is small, as this well was sunk on higher ground than the Lewis well, but at depth the flow is 60,000 gallons daily. A tank will be put in from which the water will be pumped. As the smelter management desires a supply of 100,000

gallons daily, another well will be sunk within 50 feet of the first.

The mines of the Wild Bill M. Co., near Shauntie, are under option to J. W. Taylor, of Salt Lake City, manager of the Ima M. Co., with whom are associated J. F. Hatcher and G. F. Twitchell, of Columbus, O. The same parties control the interests of the Hub M. Co. in this district, between the Wild Bill and the Majestic.

JUAB COUNTY.

D. D. Hanks, J. Larsen and A. Bray have taken a lease on the 1000-foot level at the Bullion-Beck mine, near Eureka.

Superintendent C. Wheeler is unwatering the South Swansea mine, near Eureka.

President J. M. Higley of the Joe Daly M. Co., operating in Tintic district, near Eureka, says they have arranged for the use of the Undine tunnel with which to continue the exploration of its ground.

Manager Wheeler is unwatering the South Swansea mine, near Eureka.

PIUTE COUNTY.

(Special Correspondence).—The mine of Moore & Mathews, on Deer creek, has been sold to Salt Lake men.

The L. & N. group of fifteen claims in the Ohio Creek mining district, owned by Nielson & Orrick, and on which J. F. Mount of Richfield has a bond and lease for \$50,000, will be taken up and operations commenced.

G. F. Dalton, manager of the Gold Vein M. Co., will begin work as soon as supplies can be gotten in.

M. P. Braffett, secretary and treasurer of the Gold Fissure Co., and G. W. Snow are surveying the properties owned by this company.

The Iron mine, east of Marysville, is working and will ship a carload of ore daily. The returns from shipments recently made were satisfactory. F. E. King is superintendent.

The Gold Queen, at Deer Creek, has started up for the season and will employ a large number of men.

The Copper Butte is working night and day shifts on a tunnel.

Marysville, April 25.

SALT LAKE COUNTY.

Superintendent E. McCarrick reports copper ore struck in the Fridi mine at Bingham.

W. S. Hall, superintendent of the Copper Belt railway at Bingham, says within eighteen months the camp will be sending to the valley smelters at least 120,000 tons of ore per month, the increase to be contributed to by the Yampa, the Boston Con., the Highland Boy Con., the Dalton & Lark and a number of others. At present his line is handling 350 tons of ore daily. The Kempton sent this week a 300-ton lot, while the Storey management is loading 200 tons, with several smaller shipments to follow.

W. Hatfield of Salt Lake City, manager of the Albion mine at Alta, says a sufficient flow of water is in the streams to supply the power plant and it will be placed in commission again next week, and development work resumed in the mine.

The Godbe Agitating Cyanide Process Co. has been incorporated at Salt Lake City by E. L., A. H. and M. C. Godbe, G. N. Lawrence and S. D. Wertheimer.

Manager G. H. Robinson of the Tintic M. & Dev. Co. says preparations are being made for the construction of a mining plant at the Yampa mine at Bingham.

Manager D. McVichie reports the volume of water escaping from Mascot (Dalton & Lark) tunnel at Bingham has been lowering the flood in the Dalton ledge at the rate of $\frac{1}{2}$ of an inch daily. The flow is at the rate of 2300 gallons per minute. Ultimately the tunnel will drain at depth more than twenty miles.

Development work has been resumed at the Kempton mine, near Bingham, and shipments are in progress, two carloads of ore from the dump having been delivered at the railroad last week. Six teams are employed, and the tonnage already at surface and what is coming from the mine is being sent down at the rate of sixty tons daily.

A strike is reported made in the Wheeler & Wilson mine, near the head of Big Cottonwood canyon, near Alta, the ledge being tapped at a depth of 1000 feet below the outcrop. Manager W. C. Tracy says the tunnel, which is in 150 feet, is nearing a shoot of ore and the mine will develop into a regular shipper by June 1.

Last week the Silver Shield Co. at Bingham, which is extending the Franklin (Niagara) tunnel by permission of the United States M. Co., broke into its own territory at 4800 feet from the tunnel's mouth. Following the vein the tunnel is running on 2 feet of copper-iron ore. This tunnel will also drain their workings.

The directors of the New State G. M. & M. Co. at Salt Lake City have decided to put in a 50 H. P. steam hoisting plant, including a geared hoisting engine, 60 H. P.

boiler, 10 H. P. engine for dynamo duty. F. L. Hoock and J. Dederich are interested with Eastern men. The group is 14 miles southeast of Salt Lake City, between Little and Big Cottonwood creeks, near Alta, with a down-hill haul of 5 miles to the railroad.

Manager C. K. Roland of the Hogg-Swayne Oil Co., of Houston, Texas, says they have bought 12,000 acres of oil lands extending north of Salt Lake City along the lake, from the mouth of Jordan river to west side of Promontory. Development will begin this month.

The properties of the Sampson M. Co. at Bingham have been taken over by the Bingham C. & G. M. Co., and in future will forward their entire output to the furnaces of that company in the valley.

The Mohave C. M. Co. has been incorporated, with headquarters in Salt Lake City; J. C. E. King, G. H. Smith and V. E. Huntzicker.

SUMMIT COUNTY.

It is reported plans have been drawn for a mill to be built at the mouth of the Alliance tunnel, at Park City, for the Kearns-Keith M. Co.

Manager Turner of the J. I. C. mine, at Park City, has decided to sink the shaft an additional 200 feet, making a depth of 700 feet.

UTAH COUNTY.

Work has resumed on the mines of the American Fork M. Co. at American Fork, says Manager M. Fridel at Salt Lake City.

W. L. Goodsell, manager of the Goodsell mines, near American Fork, says he has begun shipment of ores that have accumulated during winter development.

J. A. Jacobson at Santaquin, managing development work on the Crown Jewel group of claims under option, says the shaft is down 50 feet, the vein showing the full width of the shaft, and carries values of 20% lead, 24 ounces silver and \$2 gold.

WASHINGTON.

FERRY COUNTY.

J. Fitzwilliam, superintendent of the Zala Con. at Sheridan, says he is running three drifts southward on the vein on the 100, the 300 and an intermediate level, and is preparing for stoping. Shipments will begin next week. Where the ledge is narrow the ore requires but little assorting. The ore is first gouged out and then the footwall is broken the regular size of the drifts.

SPOKANE COUNTY.

It is reported at Spokane the American S. & R. Co. will build a smelter there to handle both lead and copper ores and have a capacity of 600 tons a day at the start. D. C. Johnson of the East Helena smelter says the site is still somewhat unsettled. Spokane and coast points are being studied before a decision is made. The coast points claim superiority because of their accessibility to tide water and the consequent cheap transportation. Coke and coal are abundant along the coast. On the other hand, Spokane is the natural center of the mining camps, with the Coeur d'Alenes, Rossland, the Boundary, Republic, the Slocan, Baker City and the Pend d'Oreille, and Crow's Nest coke.

STEVENS COUNTY.

Northport reports say the Le Roi smelter is on the eve of another shutdown, unless the coke problem is at once solved. There is enough to run three furnaces until the 4th inst. The supply from the Sound is of such inferior quality that Virginia, Superior or Fernie coke is necessary to use with it to keep the furnaces running. Several thousand tons are being sent from the East and the Sound, but several days must elapse before any can arrive. Considerable anxiety is felt regarding the Great Northern strike. Matters are in such a shape that a tie-up on that system will have the same result on the works.

Thirty-two feet of high-grade hematite are reported opened on the Iron Hill mine, which has been in operation under Great Northern management for several months past. The mine is 10 miles west of Valley, on the Spokane Falls & Northern Railway.

WYOMING.

SHERIDAN COUNTY.

Both mines of the Sheridan Coal Co. at Dietz, 4 miles west of Sheridan, are shut down, as a result of a strike, and 200 men are out. The miners have but recently organized and a demand was made on Superintendent Kennedy that the union be recognized. The demand was made by a committee several members of which were not in the employ of the company at the time, and Kennedy refused to treat with them. No grievance was presented to him.

SWEETWATER COUNTY.

The Sioux City & Rock Springs Coal

Co., with headquarters at Sioux City, Iowa, has been incorporated. The property of the company is 25 miles east of Rock Springs, and the main works are within three-quarters of a mile of the main line of the Union Pacific Railroad, comprising 800 acres. Three veins have been developed 4, 7 and 20 feet in thickness, being separated by strata of sandstone. The officers are H. D. Brown, E. A. Conway, A. Holt, L. O'Harrow, H. R. Prairie, E. D. Waterman and A. B. Kiler.

UINTA COUNTY.

The discovery of gold is reported in the Teton mountains, south of Yellowstone Park. The formation is described as Archean schist, with overlying sedimentary beds, similar to the Black Hills of South Dakota, and portions of Colorado. The strike is said to have been made 6 miles east of Victor, and 100 claims are taken, though there are several square miles of territory yet unprospected. Gold can be panned from surface soil and an outcrop of quartz is reported as assaying \$9 per ton.

FOREIGN.

AFRICA.

RHODESIA.

Bonsor Gold Co. report March output: Forty stamps ran twenty-nine days, crushed 4000 tons, producing 1127 ounces; treated by cyanide 3700 tons, yielding 497 ounces. Globe & Phoenix Gold, during March, thirty-five stamps ran 28 1/2 days, crushed 5816 tons of ore; duty per stamp per day 5.76 tons; yield 2263 25 ounces bullion; tallings assay 2 397 dwt. fine gold; cyanide, tons treated, 3150; yield 459.4 ounces bullion. Rezende, March result: Twenty stamps, running twenty-seven days, crushed 3025 tons, yielding 896 ounces fine gold; recovered from tallings by cyanide eighty-five ounces fine gold; twelve tons concentrates produced, containing forty-eight ounces fine gold. Warleigh (Rhodesia) Development, April 8: Guinea Fowl main shaft down 240 feet; driven on second level, 500 feet; reef 2 feet wide, averaging one ounce gold per ton; reef in the winze to third level, 3 feet wide, averaging 2 ounces per ton. Black labor is plentiful.

The total gold output of companies making returns to the Rhodesian Chamber of Mines at Bulawayo for the month of March, says the London Mining Journal, amounted to 19,626 ounces, an increase of 2536 ounces as compared with the previous month, and an increase of 2735 ounces as compared with the corresponding period of 1902. The monthly returns for 1903-02 have been as follows:

	1903.	1902.
January.....	16,245	15,955
February.....	17,090	13,204
March.....	19,626	16,891
April.....		17,559
May.....		19,698
June.....		15,842
July.....		15,226
August.....		15,747
September.....		15,164
October.....		16,849
November.....		15,923
December.....		16,210

TRANSVAAL.

Cassel Coal Co., March output, 8268 tons. Crown Deep, March results: One hundred and ten stamps, working twenty-eight days eighteen hours, crushed 15,004 tons; yield 3139 ounces fine gold; 10,430 tons of sands and concentrates treated by cyanide works, yielding 2265 ounces; 3799 tons of slimes treated, yielding 275 ounces. Estimated profit, £8100.

Durhan-Rodepoort Gold, March results: Quartz milled, 8550 tons, 70 stamps, 26 days, 4328 ounces; tallings treated, 5885 tons, 1373 ounces. Ferreira Deep, March results: 50 stamps, 29 days, crushed 7700 tons, yield, 3550 ounces; 5900 tons sands and concentrates treated cyanided, yielding 1476 ounces; 2275 tons slimes, yield 213 ounces. Geldenhuis Deep, for March: 150 stamps working 30 days, crushed 20,700 tons; yield, 5788 ounces; 14,238 tons sands and concentrates cyanided, yielding 2731 ounces; 6455 tons slimes, yield 526 ounces. Langlaagte Deep, for March: 75 stamps working 26 days 17 hours, crushed 10,837 tons, yield 2802 ounces; 8808 tons sands and concentrates cyanided, yield 1235 ounces; 2160 tons slimes treated, yield 112 ounces.

WEST AFRICA.

Ashanti Goldfields Corporation, for March: Obuassi mine, 580 tons yielded 1370 ounces, from development work, 2110 tons yielded 1110 ounces. Ashanti Sansu, March returns, 1120 tons, yielding 1350 ounces.

AUSTRALIA.

WEST AUSTRALIA.

Some of the leases formerly worked by the Challenge Gold Estates Proprietary

at Niagara, and abandoned, are becoming paying propositions in the hands of practical mining men. While the company held possession of the ground development work was confined to shallow prospecting, no effort being made to test the leases at depth.

NEW SOUTH WALES.

A rich alluvial find is reported from Ilford, near Mudgee, and over 200 men are on the field. Alluvial gold mining has been carried on in the district for fifty years; but this discovery is on Carwell creek, which had not hitherto been prospected.

The Araluen Central Gold Dredge report having won to date £17,772 in gold in their dredging operations.

In view of the advance in the price of lead, the British Broken Hill Co., at Barrier, has determined to reopen its mine, and when the price of lead increases still more several other mines will be reopened. The British mine has been practically shut down since 1901, as only a couple of men were employed in keeping the underground workings in repair. It is estimated that there are 160,000 tons of sulphide ore exposed in the mine.

VICTORIA.

The gold yield of Victoria for the past three months amounted to 182,265 ounces, showing an increase of 19,998 ounces, as compared with the corresponding period of last year.

CANADA.

ALBERTA.

A landslide of considerable extent occurred on the side of Turtle mountain at Frank, April 29th, said to have been caused by an explosion of fire damp in the Frank colliery. The slide buried a portion of the town, killing fifty-six people, and causing considerable other damage. The Old Man's river, which flowed through the center of the town, was dammed up with fallen rock to a height of 80 feet. Of seventeen miners at work underground, two died of suffocation and the other fifteen worked their way out, cutting through 30 feet of debris at one of the tunnels, the main entrance to the mine being completely blocked by the slide.

BRITISH COLUMBIA.

Plans are being drawn for a tramway from the Kootenay mine, near Rossland, to the Canadian Pacific Railroad, estimated to cost \$25,000, and will carry ore at 10 cents per ton. The distance to be covered is approximately a mile. Shipments to the smelter began this week. The available supply of teams being short, the management claims to have difficulty in contracting for the hauling of the tonnage it desires to ship even at \$1.25 per ton, which is higher than was paid last winter. The tram will start from the sixth level of the mine, to which adit all the ore broken in the stopes above can be delivered by gravity.

It is reported that the Great Western mine, near Rossland, will be unwatered, operations beginning June 1st. The mine has been closed down for two years.

Two more mines were added to the shipping list at Rossland last week—the White Bear and the O. K. The I X L mine has joined the working list, to be followed next week by the Jumbo, the Novelty and the Spitzee.

Instructions have been received by cable from London for opening up of work in Camp Mansfield, at the head of the south fork of Kaslo creek, near Kaslo, says the Nelson News. The Kaslo-Slocan M. Co. are the principal operators. The ore is largely free milling gold.

Manager D. W. McVicar of the E Pluribus Unum and Lancashire mines, near Greenwood, reports tellurides struck in the shaft of the former at a depth of 65 feet.

The Empress of India group, on the North Fork of Barrett creek, 4 miles from Ymir, has been bonded to J. W. Ross of Buffalo, N. Y., and work will begin this month. The group, which includes the Empress of India and Helena claims, together with four claims of the adjoining Monarch group, are located along a belt of gold-bearing porphyry and are 3 1/2 miles distant from the Porto Rico siding, on the Nelson & Fort Sheppard Railroad.

The Homestake group, on Pool creek, near Lardeau, has been sold to Managing Director W. B. Pool of the Ophir-Lade Syndicate for \$30,000, says the Rossland Miner.

The proposed Granby No. 4 tunnel at Phoenix will be 1000 feet long as a starter. In the Slocan, since Jan. 7, 1903, ten mines have shipped 2485 1/2 tons of silver-lead ore from Sandon, seven mines shipped 645 tons from McGulgan and ten mines shipped 999 tons from Slocan lake points. The Payne and the Ivanhoe, near Sandon, have shipped 733 tons of zinc.

Superintendent F. T. Hamshaw of the

McKee Con. Placer Co., operating on McKee creek, near Atlin, says he will put in a steam shovel to handle a daily average of 1000 cubic yards of gravel this summer. Preliminary prospecting is being done to determine the width of the channel by a series of cross drifts sunk to bedrock. It is not intended to do any hydraulic mining this season.—The Christopher group, below the ground of the Atlin M. Co., will be reopened this season, says Superintendent C. Hamshaw.

The Brook's property on Spruce creek, near Atlin, will be operated by Griffith & Loveridge for the Pine Creek Power Co., says the Atlin Claim.

The Canadian Smelting Works at Trail will add a department for the reduction of the zinc-silver-lead ores to its present smelting plant.

Work has been resumed on the Ruth-Esther gold mine on Sophia mountain, in the Trail Creek district, near Rossland, says J. O. Stout, part owner. The company expects to cut the ledge within the next 30 feet. The claims are near the Portland and the Velvet mines. The principal owners of the property are Goodeve Bros. of Rossland and C. C. Grove of Spokane, Wash.

With last week's ore shipments, the Granby mines at Phoenix have sent out 100,000 tons since Jan. 1 to the company's smelter at Grand Forks. The Emma mine, in Summit camp, rejoined the shipping list last week and this week the Snowshoe, the B. C. mine and the Sunset began sending out ore again. Total Boundary shipments for last week were 10,335 tons; total for the year, 152,664 tons. The Granby smelter treated 7903 tons with three furnaces in blast, making a total of 99,602 tons treated since Jan. 1.

In East Kootenay the mines at the Crow's Nest collieries are making good headway since the settlement of the strike. At Michel the output has reached a daily average of 1200 tons. The coke ovens are running full capacity. At Coal Creek the daily average output is 800 tons. No. 3 mine began work this week. Out of 424 ovens at Fernie 300 are in use. At Morrissey the output has reached 600 tons. A narrow gauge locomotive has been put on. The construction on the coke oven plants at Michel and Morrissey is being pushed. At the Coal Creek mines men are at work on the motor road connecting tunnels Nos. 4 and 5 with the tipples. These new mines will be developed this season. Trial drifts have struck the coal and permanent tunnels will be built. The power house for the electric plant at the Coal Creek mines is finished and the 250 H. P. engine is being set up. The power line from the plant to Fernie will be built this month.

The Ramher-Cariboo mine, near Rossland, has suspended operations pending the passage of the annual snowfalls. An effort was made to dislodge the slides with powder, but this failed. They will resume by June 1.

The Silver Cup mine at Trout Lake, near Lardeau, is sending out eight tons a day.

The rise of the Fraser river has stopped the working of the placer ground laid bare at Yale and other points on the Fraser.

Shipments from Rossland camp for the week ending April 25 and for the year to date are as follows:

	Week.	Year.
Le Roi.....	2,838	60,984
Center Star.....	1,688	25,868
War Eagle.....	1,080	18,030
Le Roi No. 2.....	840	7,839
White Bear.....	54	54
O. K.....	25	25
Giant.....		335
Velvet.....		2,166
Kootenay.....		225
Homestake.....		90
Totals.....	6,525	115,616

MEXICO.

CHIHUAHUA.

A. Marchand of El Paso, Texas, says he has bonded the Carolina mine, 12 miles east of Ahumada station on the Mexican Central and 81 miles south of El Paso. Work will be started this month. The ores are silver-lead.

The mill and aerial tramway of the Adela mine at Santa Barbara are in operation.

D. W. Shanks, of Los Angeles, Cal., has bought the Casualidad claim, 5 miles north of Parral and 200 yards from the Mexican Central railroad.

A. L. Rossen and H. S. Townsley have made a denouncement of a red hill 3 miles from Parral, believing it to contain cinnamon.

The Adela mine of El Oro Camp, near Parral, is shipping sixty tons of high-grade ore daily.

Seven and one-half feet of ore that runs 108 ounces of silver to the ton are reported in the La Iguana mine at Parral,

in the bottom of the 220-foot shaft. Ore is regularly shipped at the rate of twenty-five tons per day.

At Terrazas the San Salvador mine has been sold to J. W. McNeal of Guthrie, Oklahoma, for \$100,000 gold. The ore carries values in silver and lead.

The Dithridge-Burr Exploration Co. of New York has organized to operate at Parral, and G. A. Burr of Parral is vice-president and general manager. This company has taken over the Culentrillo mine, near the San Francisco del Oro mine, and fifty men are at work. It is a tunnel proposition.

The Hidalgo M. Co. is operating nine of its seventeen mines in Parral district, from which it is shipping 6000 tons monthly to the smelters.

COAHUILA.

The San Carlos Copper Co. has been incorporated, and, among other work, it proposes to construct a railroad from Linares, on the Gulf division of the Mexican Central, westward a distance of 125 miles to its copper mines, which are at San Carlos.

DURANGO.

The Santa Nino mine, near Durango, is reported shipping sixty tons daily to Smelter No. 3.

The Compania Minera de San Acasto has obtained from the Government a concession for the construction of a railway line from its mines near San Acasto to one of the stations on the line of the Mexican Central.

There are coal fields at San Pedro del Gallo which have been partially developed and the Penoles M. Co. of Mapimi will consider building a railroad from Mapimi into these coal fields to develop them, and at the same time insure to the mining company a good supply of cheap coal.

LOWER CALIFORNIA.

According to an official of the Boleo Co. of Paris, the Boleo copper mines, near Santa Rosalia, are turning out 70,000 tons of matte annually, which carries 40% copper. The company employs 200 men at the mine and smelter. A regular line of steamers run between Santa Rosalia and Guaymas. The matte is shipped to San Francisco, Cal. The company has a railroad in operation, and it is expected a road will be built across the peninsula to connect Santa Rosalia with another mine recently bought.

MEXICO.

(Special Correspondence).—The El Oro mines are located in the Talpajahua mining district on the line of the State of Michoacan. The company is preparing to increase its plant by adding 100 stamps, making a total of 200 stamps. The ore at present exposed in the San Rafael vein is reported to be 1,000,000 tons, which can all be worked profitably. It is expected the mill will be in operation within eighteen months, contract for which has been let. The company has accepted an offer from Charles Butters & Co. of London, who have agreed to erect a plant capable of treating 200,000 tons of tallings, at the rate of 15,000 tons per month. R. M. Raymond is the general manager of the company. Talpajahua, April 25.

At El Oro, on the border between the States of Michoacan and Mexico, the El Oro M. & Railway Co. is putting in a second 100 stamps, the new milling plant to cost \$340,000 and to be completed in eighteen months. The San Rafael vein has 1,000,000 tons of ore in sight. From the El Oro vein 200,000 tons of tallings have accumulated and a cyanide plant capable of treating 500 tons daily is to be erected to treat them. By summer there will be 600 stamps dropping in the camp. The Dos Estrellas mine is having an 80-stamp mill put up. The Esperanza has 120 stamps and 120 more are going in. The American M. Co. is building a second 100 stamps. The ores carry values in gold and silver.

OAXACA.

Reports from the Taviche M. & M. Co., in Taviche district, near Ocotlan, say that the mill is expected to be finished and in operation by May 15th. It is a concentration and amalgamation plant of 100 tons daily capacity, and the ores carry gold and silver.

SONORA.

The Dewey mine, near Willard Station, on the Sonora Railway, south of Hermosillo, has developed a body of graphite and is making regular shipments of that material, which is used as a lubricant. It is shipped to Bethlehem, Pa., where the company owning the mine has a factory.

Superintendent J. Reay of the Pavo Rico mine, near Douglas, Ariz., owned by the Atlas Exploration & M. Co., says he has men at work on the ground recently bought by the company, and several stringers of copper ore have been struck in the

shaft on the El Pavo Rico Grande, showing values in gold and silver.

The Douglas International says the Eva group of thirty pertenencias and another gold quartz group near Douglas have been sold to Detroit, Mich., men. The price for the latter group, which includes the Cinco Senores, Don Ramon, Dos Amigos and Adan, being 115 pertenencias, was \$110,000.

Plans are being prepared by G. B. Earnshaw for a 120-stamp gold mill and cyanide plant for the Cerro Prieto mines of the Nogales Copper Co. at Nogales, Ariz. The company has offices in Nogales and Chicago, Ill.

J. W. Rofelty, E. A. Armstrong, M. D. Hamilton, N. A. Walcott et al have formed a syndicate to operate in Sonora. They have bought a group of mines consisting of the San Carlos, San Ramon, Los Cuartos Tobaris gold properties and the La Fortuna and San Francisco silver properties. They are on the northern slope of San Carlos mountain, near Rio de San Carlos, and are reached by rail from Hermosillo, thence 100 miles by road to Baviacora. The Tobaris and Los Cuartos mines were formerly worked by the Spaniards, and there are a number of shafts and tunnels. There is a 10-foot ledge on the Tobaris. A stamp mill, a cyanide plant and other equipments will be installed.

NEW ZEALAND.

At the Waihi G. M. Co., Ltd., up to the present the working costs of the mine and mills have been on the highest scale. Development work had to be done on a large scale, and the erection of milling and mining plant necessitated a large outlay of capital. This might have been lessened considerably if the most competent persons had been employed to select and erect the machinery in the beginning. The introduction and abandonment of dry crushing caused the greater part of the milling plant to be converted from dry treatment to wet, which necessitated a large expenditure. Further expense in this department has for a time come to an end. The mine developments are well advanced, and in this respect the managers have expressed themselves that further depth is not required at present owing to the fact that the ore at the Nos. 6 and 7 levels are large. By the contract system a larger amount of work is being accomplished at a less cost. The miners' agitation has proved a gain to the employer and a loss to themselves.

The Tairua Broken Hills reports a discovery of another new lode, making four payable veins. The high-grade ore met with since the mine commenced operations under this company continues, and the output of bullion is large. With twenty stamps they have paid off liabilities, extensively developed the mine, and paid dividends amounting to 1s 9d per share. H. H. Adams is manager. The works are all carried out by contractors and the working costs are low.

TASMANIA.

The Mount Lyell M. Co. reports at Melbourne office, April 9: From March 5 to April 1, inclusive, a total of 21,565 tons of ore has been treated, the average assay value of the ore being: Copper, 2.19%; silver, 2.09 ounces per ton; gold, .072 ounce per ton. In addition to the above, there has been treated 3983 tons of purchased ore and metal-bearing fluxes. The converters have produced during the same period 416 tons of blister copper, containing: Copper, 410 tons; silver, 42,847 ounces; gold, 1586 ounces.

At Mount Zeehan silver-lead mines the March output was 370 tons of silver-lead ore, containing about 200 tons of lead and 37,000 ounces of silver.

PERSONAL.

W. TREADWELL, of Mayer, Ariz., is in Chicago, Ill.

J. CRONIN, of Spokane, Wash., is in San Francisco, Cal.

N. B. KNOX has returned to San Francisco, Cal., from Prescott, Ariz.

C. E. WATSON is manager of the Ordah-Tonopah M. Co. at Tonopah, Nev.

S. S. CLAWSON of Salt Lake City, Utah, is in New York on mining business.

E. J. DELANO, a mining man of Los Angeles, Cal., is in San Francisco, Cal.

MALCOLM MCLEISH, a mining man of Denver, Colo., is in San Francisco, Cal.

J. H. MACKENZIE of San Francisco, Cal., is examining mines in New Mexico.

E. L. GODBE of Salt Lake City, Utah, of the Eureka Hill M. Co. is at Pearl, Ida.

F. L. SIZER, manager of the Kimberley-Montana Co. of Montana, has returned to Helena, Mont., from San Francisco, Cal.

C. M. DULL returned to Salt Lake City, Utah, last week from a trip to South Africa.

O. F. RUBEL of Spokane, Wash., is examining mines near Downieville, Sierra Co., Cal.

C. G. FENNEL, manager of the Val Verde smelter, Val Verde, Ariz., is visiting New York.

S. O. SNYDER of the Idaho Dredging Co. has gone to Idaho from Salt Lake City, Utah.

G. W. MIDDLETON, manager of the Copper Cobre M. Co., Prescott, Ariz., is in New York.

P. A. JOHNS, manager of the Braganza G. M. Co., has returned to Prescott, Ariz., from Chicago.

O. J. SALISBURY of Salt Lake City, Utah, interested in Utah mines, is traveling in California.

T. J. NICHOLS, of Auburn, Placer county, Cal., is in San Francisco, Cal., on mining business.

F. JANNEY, superintendent of the De Lamar mill at De Lamar, Nev., is in Salt Lake City, Utah.

W. I. SMART, interested in mines at Placerville, El Dorado county, Cal., is in San Francisco, Cal.

J. R. ROBERTS returned last week to Parral, Mexico, from Kansas City, Mo., on mining business.

F. A. EARLS returned last week to Salt Lake City, Utah, from a trip to Montana, on mining business.

W. H. EDWARDS, of Salt Lake City, Utah, is examining mining interests at Muncey Creek, Nev.

A. E. SNOW is manager May Day M. Co., operating at Eureka, Utah, vice J. A. Hunt, resigned.

W. F. HALL of Douglass, Ariz., is in Phoenix. He is interested in mining property in Sonora, Mexico.

J. M. HAMILTON returned last week to Salt Lake City, Utah, from a trip to Nevada on mining business.

H. C. PLUMMER, of Placerville, El Dorado county, Cal., is in San Francisco, Cal., on mining business.

H. W. TURNER of San Francisco, Cal., is making mine examinations near Medford, in southern Oregon.

O. C. WRIGHT, president Blue Bird M. Co., is in New York from Sumpter, Or., on company business.

L. GINGER of Colorado Springs, Colo., is in Boston, Mass., after an examination of mines in Sonora, Mexico.

PRESIDENT GILL, of the Shannon C. M. Co., has returned East from a trip to their mines at Clifton, Ariz.

R. E. OBER, superintendent Beatrice mine, Murphys, Calaveras county, Cal., has returned from the East.

E. W. ILIFF of Chihuahua, Mexico, is manager of the San Salvador mine at Terrazas, Chihuahua, Mexico.

H. T. BENSON returned last week to Olinghouse, near Wadsworth, Nev., from an extended business trip East.

W. MORRIS, assayer Octave G. M. Co., Octave, Ariz., is in Lima, Ohio, called there by the death of his father.

T. L. DARBY of Denver, Colo., is at Bigbug, Yavapai county, Ariz., where he owns interests in the onyx fields.

H. L. PICKETT returned to Salt Lake City, Utah, from an examination of mining property in northern Arizona.

MANAGING DIRECTOR E. O. LEE, of the Dexter mine at Tuscarora, Nev., is at Tuscarora from Salt Lake City, Utah.

C. KOELLE is superintendent Compania Metalurgica Mexicana, at San Luis Potosi, Mexico, vice C. M. Van Cleve, resigned.

O. P. HOPKINS, manager Samson G. M. Co., near Prescott, Ariz., is in Colorado Springs, Colo., on mining business.

A. E. SNOW is managing director of the May Day M. Co. of Salt Lake City, Utah, operating at Eureka, Tintic district, Utah.

M. FRIDAY, of Salt Lake City, Utah, is at American Fork, Utah, to start work on the property of the American Fork M. Co.

W. J. LAWRENCE AND H. A. SMITH of Salt Lake City, Utah, are at the mines of the Lawrence Con. Co., in Elmore county, Idaho.

R. S. TOWNE of New York, president Compania Metalurgica Mexicana, is at the company's smelter at San Luis Potosi, Mexico.

F. T. HAMSHAW of New York is at Atlin, B. C., to superintend operations on the placer properties of the McKee Con. Placer Co.

H. KEHOE, E. M., has returned to Spokane, Wash., from an extended trip through Arizona, southern Nevada and California.

C. D. BERG of Lead City, S. D., is superintendent and manager of the Yellow Creek G. M. Co., operating at Dumont, S. D.

G. B. EARNSHAW is consulting engineer for the Nogales Copper Co., owning the Cerro Prieto mines near Magdalena, Sonora, Mexico.

SUPERINTENDENT F. SMITH, of the Wolverine and Mohawk copper mines, near Houghton, Mich., returned last week from Arizona.

R. H. ROBERTS of Hancock, Mich., is at Bisbee, Ariz., to take charge of the financial management of the Wolverine & Arizona C. Co.

MANAGER R. COX of Ouray, Colo., is to manage the Silver Lake mines, near Silverton, Colo., for the Guggenheim Co., vice S. I. Hallett.

J. P. ELKIN of Indiana, Pa., is president of the Terrenates Con. M. Co., operating at Parral, Chihuahua, Mexico, succeeding A. D. Meloy.

C. BROWN has resigned as superintendent of the Old Colony M. Co. in Tintic district, near Eureka, Utah, and has gone to Ogden, Utah.

L. H. OUTZEN of Salt Lake City, Utah, manager of the Annie Laurie Extension mine at Marysville, Utah, is in St. Louis, Mo., on company business.

H. CLEMENT is superintendent of the Eagle and Blue Bell mines at Eureka, Utah, with J. B. Creighton of the Tesora as assistant superintendent.

H. BLAUVELT, of Prescott, Ariz., superintendent of Cash, Monte Cristo and Catoclin M. Companies, is visiting New York and other Eastern cities.

GEORGE L. KAEDING, E. M., of San Francisco, Cal., has gone to El Dorado county, Cal., to examine mines near Placerville, for prospective purchasers.

B. M. SNYDER of Anaheim, Cal., is assayer and chemist at the B. C. Copper Co.'s smelter at Greenwood, B. C., vice G. Sundberg, who is at Sand Point, Ida.

MANAGER G. H. ROBINSON and J. W. Neill, chief metallurgist for the Tintic M. & Dev. Co. of Eureka, Utah, have returned to Salt Lake City, Utah, from the East.

J. E. ROBERTSON, JR., representing the W. S. Tyler Co., Cleveland, Ohio, the past three years in Mexico, will have charge of their branch office in El Paso, Texas.

H. PASCHAL of Chicago, Ill., a director of the Tri-Bullion S. & D. Co., owning the Starlight mines near San Carlos, Ariz., returned last week to Chicago from a trip to the mines.

A. S. DWIGHT has resigned as manager Compania Metalurgica Mexicana, at San Luis Potosi, Mexico, and is in New York, consulting as to the management of a property in Sonora, Mexico.

MANAGER S. I. HALLETT of the Silver Lake mines, owned by Guggenheim interests, near Silverton, Colo., may go to Mexico to assume charge of mining property for the same company.

P. JOHNSON has resigned as manager of the British Columbia C. Co.'s smelter at Greenwood, B. C., and has gone to Prince of Wales Island, Alaska, to build a smelter for an English company.

W. A. PRITCHARD, manager of dredging operations on the Gold Coast, West Africa, is in San Francisco, Cal., buying dredging machinery. He has been inspecting dredgers and mining operations at Oroville, Cal.

C. M. VAN CLEVE has resigned as superintendent Compania Metalurgica Mexicana, at San Luis Potosi, Mexico, and goes to Mapimi, Durango, Mexico, to assume a similar position with the Compania Minera de Penoles.

E. A. WILTSEE, E. M., of Denver, Colo., has been asked to sit as American representative of the Venture Corporation, Ltd., of London, Eng. Mr. Wiltsee's office will be at the company's headquarters in the Mills Bldg., New York City.

IVAN RAGAZ has resigned as superintendent of the Sierra Mojada and Santa Eulalia mines of the Guggenheim Exploration Co. in Chihuahua, Mexico, and after May 10 will be in charge of the operating department of the Stilwell mining interests, with headquarters at Chihuahua, Mexico.

Obituary.

S. P. SMITH, manager of the Carson Hill G. M. Co. at Irvine, Calaveras county, Cal., was accidentally killed April 20th while examining some heavy machinery at the Gold Hill mine, near Angels. Deceased was a native of Maine, aged 49 years.

S. MORGAN SMITH died in Los Angeles, Cal., April 12th. He was born Feb. 1, 1839, in Davie county, North Carolina. He attended the Moravian College at Bethlehem, Pa., from which institution he graduated in 1861. During his college course he prepared himself for the ministry and from 1861 to 1866 he was pastor of the Moravian Church at York, Pa. In 1864, he was elected Chaplain of the Two Hundredth Regiment, Pennsylvania Volunteers, in which capacity he served until the end of the war. In 1866, he went to Canal Dover, Ohio, where he had charge of a congregation for five years. Here he was forced to quit the ministerial work in 1871, on account of a serious throat affliction, and he returned to York. In 1875, he became interested in the manufacture of water wheels. His first wheel was known as the "Success," many of which were installed in mills and factories throughout the country. Later he placed upon the market the "Improved Success," a wheel giving more power than the "Success" of the same diameter. He found ready sale for a great many of these wheels in this and foreign countries and many hundreds are in use driving all kinds of machinery. In 1892, he engaged in the manufacture of the "McCormick" water wheel. Since he began the manufacture of the last-named wheel, he supplied many of the largest plants in operation in this country and Canada and shipped extensively to foreign countries. Although the shops were small in which he started the manufacture of water wheels, they had assumed such proportions that, at the time of his death, they were among the largest and best in the nation. He was president of the Atlanta Water & Electric Power Co., as well as president of the company which bears his name. As a minister of the Moravian church, he was a close student and an eloquent orator. In his demeanor, he was a man of warm disposition, kindly nature and charitable in every sense.

Commercial Paragraphs.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., have leased additional shops and are in shape to build their cranes and hoists in time to insure prompt delivery.

THE Ficher Lead Co. announce the removal of their Chicago office on May 1 to more convenient and commodious quarters in the Tacoma building, La Salle and Madison streets.

THE Risdon Iron Works of San Francisco, Cal., report general sale of the Evans hydraulic water lift, for use in all elevating mines, sending one this week to Bahia, Brazil. They are made in different sizes to suit local requirements.

J. E. ROBERTSON, JR., American representative of the W. S. Tyler Co., wire cloth manufacturers, Cleveland, Ohio, has moved his headquarters from Mexico City to El Paso, Texas, and will carry a stock of wire cloth at that point.

THE Brown Corliss Engine Co. of Corliss, Wis., have an order from the Saxony Worsted Mills, Newton, Mass., for one 16 & 26x42-inch cross compound Corliss engine, and an order from the Berlin Mills

Co., Gorham, N. H., for four 24x42-inch simple Corliss engines.

G. W. MYERS, representing the Chrome Steel Works of Brooklyn, N. Y., says the Italian-American Bank of San Francisco, Cal., will use the "welded, 5-ply, chrome steel and iron" for burglar-proof vault construction in their new building at Sacramento and Montgomery Sts.

THE C. O. Bartlett & Snow Co. of Cleveland, O., state that they have an order from the Schwartzkopf Coal Dust Firing Syndicate of Haydock, Eng., for one of their C No. 3 grill four-compartment dryers for drying coal. They also have orders for their dryer from Wood & Swart, Denver, Colo., and the Payne Con. M. Co., Sandon, B. C.

THE Buff & Buff Mfg. Co., formerly of Buff & Berger, manufacturers of surveying, engineering and astronomical instruments, No. 9 Province Court, Boston, Mass., announce the new and permanent location of their Boston city office at No. 9 Province Court, where a full line of their instruments and engineering supplies is in charge of G. G. Ledder. A special reception room is provided for use of visiting engineers.

THE Allis-Chalmers Co. of Chicago, Ill., state that "the volume of business on the books of the company to-day far exceeds that of any time since the organization of the company, notwithstanding the fact that the output of the plants has been increased to a large extent. We can see no abatement of prosperity in our various branches of manufacture. There seems to be an unlimited demand for all kinds of high-grade machinery, which is certainly a good indication that prosperity is enjoyed in all lines of manufacture."

Catalogues Received.

The 5th edition of Catalogue No. 17 of the Risdon Iron Works, San Francisco, Cal., gives the latest in construction, costs and results of the gold dredges they manufacture, with some facts and figures as to the profitable nature of that form of gold mining.

"Transit Points" is the title of a little treatise on the precise transit made by the Buff & Buff Manufacturing Co., 9 Province Court, Boston, Mass., the result of thirty years' experience with a critical clientele. The booklet will be mailed free to any address.

The catalogue from Crane Co., 25 First street, San Francisco, Cal., which they term their "Pocket Edition Catalogue" for 1902, is descriptive of valves, fittings, engine trimmings, tools, etc., and is of very convenient size for mining superintendents, at the same time being complete. They will be pleased to furnish it to any address on receipt of application for same.

"Traveling Electric Hoists" is the title of a neat and handsomely illustrated pamphlet issued by Pawling & Harnischfeger of Milwaukee, Wis., being Bulletin No. 13 of their series of interesting descriptive catalogues. These hoists can be applied in a variety of different ways: The serving machine tools, loading and unloading freight from cars, handling sheets, rods and castings, carrying lades for light casting, taking patterns to and from foundries, carrying coal to storage bins, disposing of cinders and ashes, transferring bales of cotton or other goods, handling plate glass, also in galvanizing and tinning processes. To these and many other uses the electric traveling crane can be applied. This interesting catalogue may be had upon application.

The firm of F. W. Braun Co., Los Angeles and San Francisco, have recently issued a new edition of their catalogue, "Modern Labor Saving Appliances for Assayers' and Chemists' Use," to take the place of the former edition which appeared about two years ago, and which is entirely exhausted. It is a handsomely gotten-up book, and shows in detail the line of specialties manufactured by this firm. All of their appliances are designed particularly for laboratory use, and the line embraces crushers, pulverizers, furnaces, burners, rolls, and a number of small articles that will be found convenient in metallurgical work. This firm has been established a number of years on the Pacific coast, and their specialties are in use throughout the world. During the past few months they purchased the business of John Taylor & Co., 63 First St., San Francisco, which they are continuing at 1820 Spear St., San Francisco, with increased stocks in conjunction with their Los Angeles house. Anyone interested in mining appliances can have a copy of this catalogue, which will be forwarded by Messrs. F. W. Braun Co., on request.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING APRIL 21, 1903

- 726,012.—NUT WRENCH—H. E. Andrew, Endicott, Wash.
725,651.—COMBINATION TOOL—G. L. Baker, Waterford, Cal.
725,920.—FOUNTAIN INKSTAND—J. A. Barry, Coronado, Cal.
725,922.—HOOK AND EYE—L. N. Bedford, Los Angeles, Cal.
725,821.—BED COVERING—A. W. R. Berr, Eureka, Cal.
726,149.—BURGLAR ALARM—R. M. Ducklin, Los Angeles, Cal.
725,691.—BICYCLE HANDLE—L. S. Fletcher, Anaheim, Cal.
725,835.—PLOW—N. A. Freeman, Tillamook, Or.
725,834.—AERIAL RAILWAY—L. A. Gross, S. F.
725,958.—BALING PRESS—C. E. Hardie, Chico, Cal.
725,841.—DRILL EXTRACTOR—C. A. Horan, Stockton, Cal.
725,848.—CONSTRUCTION FLOORS, ROOFS, ETC.—P. H. Jackson, S. F.
725,850.—TELEPHONE RECEIVER HOLDER—G. Konigstein, S. F.
725,973.—CAGE—A. Kuhlmann, S. F.
725,974.—BURNER—R. Livingston, Los Angeles, Cal.
725,862.—OIL VAPORIZER—J. McDermott, Berkeley, Cal.
725,854.—GOLD SAVING APPARATUS—W. B. McPherson, Los Angeles, Cal.
725,981.—AIR SHIP—T. Michelson, Los Angeles, Cal.
725,872.—BALING PRESS—J. T. Renas, Petaluma, Cal.
725,874.—PLUMBER'S CLAMP—C. Riley, S. F.
726,106.—OIL BURNER—C. W. Sievert, Los Angeles, Cal.
725,883.—GOPHER GUN—C. Sims, San Jose, Cal.
726,002.—INSCRIBER—R. H. Smith, Rialto, Cal.
725,783.—ASSEMBLING SPRINGS—J. A. Smithline, Los Angeles, Cal.
725,789.—POUCH—J. A. Smithline, Los Angeles, Cal.
726,113.—SPRING BED—J. H. Thomas, Clarke County, Wash.
726,119.—MUSIC SATCHEL—R. E. Trognitz, San Diego, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

FLOORS, ROOFS OR LIKE CONSTRUCTIONS.—No. 725,848. April 21, 1903. Peter H. Jackson, San Francisco, Cal. This invention consists especially in an improved method for rapidly laying and fixing the corrugated metal sheet bottoms which form the first portion of the structure; secondly, in a means for securing them in place and in laying the sheet bottoms at different levels, so that the thinner portions which hold the glass illuminating lights will form a continuous surface with the thicker plain portions which are a part of the structure. It also comprises a means for forming a continuous upper surface of richer and finer cement surrounding the glass and extending over the plain portion and the bottom of the deeper plain portion made of a different quality, and in so marking or lining the surface of the plain portion as to prevent cracks by reason of unequal expansion and contraction.

BALING PRESSES.—No. 725,872. April 21, 1903. J. T. Renas, Petaluma, Cal. This invention consists of certain novel features in baling presses of the vertical type, and particularly in the feed mechanism thereof, whereby the feed gate is automatically operated in relation to the movement of the plunger. It also consists of a brake by which the descent of the plunger is regulated, and a means of rendering the horse power portable, which latter is of great importance, as it is frequently necessary to move the press and power from one stack to another in the work of baling.

BED COVERINGS.—No. 725,821. April 21, 1903. A. W. R. Berr, Eureka, Cal. The object of this invention is to provide a quilt having increased sanitary properties over those ordinarily in use and also to furnish a quilt whose outer covering may be cleaned or replaced at any time without injuring the quilt, or in any way disturbing the padding.

TELEPHONE RECEIVER HOLDER.—No. 725,850. April 21, 1903. G. Konigstein, San Francisco, Cal., one-half assigned to Max Horwinski, Jr., and E. Horwinski of same place. This invention relates to a device for adjustably holding the telephone earpiece or receiver while it is in use and in suitable relation with the mouthpiece, so that the hands are relieved of the duty of holding the receiver and are left free to write or for other purposes.

FOUNTAIN INKSTAND.—No. 725,920. April 21, 1903. J. D. Barry, Coronado Beach, Cal. This invention relates to improvements in receptacles for containing ink in which the filling of the well is effected automatically. Its object is to provide an article unique and simple in construction, practical and easy of operation and artistic and ornamental in appearance.

OIL HEATER AND VAPORIZER.—No. 725,862. April 21, 1903. J. McDermott, West Berkeley, Cal. This invention relates to an apparatus for heating and vaporizing oil or petroleum products for ultimate use in an oil burner. The action of the apparatus is something as follows: The oil is supplied by one or more pumps, or by gravitation, and, passing through a pipe into the interior of the chamber, is first acted upon by the heat surrounding this chamber, and its temperature is gradually raised as the oil rises within the chamber until it reaches the point of exit into the surrounding pipes. Passing out through these pipes in reduced quantities, the steam acts to still further raise the temperature of the oil, on account of the small bodies which are subjected to the action of the steam, and when it reaches the exit it will have been sufficiently vaporized or heated.

GOPHER GUN.—No. 725,883. April 21, 1903. C. Sims, San Jose, Cal. This invention relates to improvements in that class of firearms known as "gopher guns" and designed to be set in the path of gophers and like burrowers and to be ex-

ploded by the movement of said animals. Its object is to provide a breech-loading gun of simple and economical construction in which blank cartridges may be used and in which the discharge of the gases will take place upwardly beneath the belly of the animal and insure his destruction.

BALING PRESS.—No. 725,958. April 21, 1903. C. E. Hardie, Chico, Cal. This invention relates to improvements in baling presses of the continuous type employing a plurality of followers operating successively by an endless carrier. It consists of a horizontal press box having a compression chamber at one end and a feed chamber at the other, a follower operable therein, means for operating the follower, a closure for said compression chamber, said feed chamber having a feed opening at the top, a closure for said opening, said closure comprising two oppositely disposed doors, cross bars secured to one of said doors, said cross bars having one end fitted to engage fixed vertical guides on the press frame and the other end extending across the top of the other door, and means including the hinged straps to lock said door.

AERIAL RAILWAY SYSTEM.—No. 725,838. April 21, 1903. L. A. Gross, San Francisco, Cal. This invention relates to improvements in overhead transportation systems employing a single rigid track and a movable cable to propel the car. Its objects are, first, to provide means by which it is possible for a passenger to continue a journey uninterrupted from time of taking car until destination is reached; second, to provide seats and afford exclusiveness for all passengers by means of improved chair-car system; third, to provide means for the occupant or occupants of any car stopping off at way stations without interfering with continuity of passage of succeeding cars.

Latest Market Reports.

SAN FRANCISCO, May 1, 1903.

METALS.

SILVER.—Per oz., Troy: London, 24½d (standard ounce, 925 fine); New York, bar silver, 53½c, refined (1000 fine); San Francisco, 53½c; Mexican dollars, 42 @ 42½c San Francisco, 42c New York.

Silver shows a material increase in price over recent quotations, and it is anticipated it may reach 55 cents within a short time. The present price is about 6 cents over quotations of a few weeks ago, a substantial increase.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50 @ \$14.75; Electrolytic, 1 to 3 casks, \$14.50 @ \$14.75; Casting, 1 to 3 casks, \$14.50 @ \$14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £60 15s spot per ton.

Copper shows a slight falling off in price, attributed to a dull market. It is believed that consumers are holding off orders, using all the stock on hand, in hope of lower price, but as many of them must soon stock up again an advance to 15 cents or more may be anticipated in May.

LEAD.—New York, \$4.37; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½ 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½; pig, \$1.75. London: £11 17s 6d per long ton—2.75c per lb.

SPELTER.—New York, \$5.75; St. Louis, \$4.60; London, £21 17s 6d per ton; San Francisco, ton lots, 6½; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$30.05 @ \$30.12; 200 lbs., 32½c; less, 33c; bar tin, 3½ lb, 35c @ 37½c. London, £137 5s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 30c; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @ \$46.00; 7½ lb.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 31c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17.15c.

NICKEL.—New York, 50 @ 60c @ lb.; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.35; gray forge, \$20.50; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....\$22.50 @ 23.00
Foundry Northern 1.....22.00 @ 23.00
Northern 2.....22.50 @ 23.50
Northern 3.....21.50 @ 22.00
Southern 1.....21.35 @ 22.35
Southern 2.....20.85 @ 21.85
Southern 3.....20.35 @ 21.35
Forge.....19.85 @ 20.85
Charcoal.....26.00 @ 27.00
Billets, Bessemer.....33.00 @ 34.00
Bars, iron.....1.85 @ 1.90
Bars, steel.....1.75 @ 1.80
Rails, standard.....28.00 @ 30.00
Rails, light.....34.00 @ 40.00

Plates, boiler.....1.90 @ 2.00
Tank.....1.75 @ 1.90
Sheets, 26 store.....2.90 @ 3.00
No. 27.....3.00 @ 3.10
No. 28.....3.10 @ 3.20
Angles.....1.75 @
Beams.....1.75 @
Tees.....1.80 @
Zees.....1.75 @
Channels.....1.75 @
Steel melting scrap.....18.50 @ 19.00
No. 1 railroad wrought.....20.50 @ 21.50
No. 1 cast, net ton.....17.50 @ 18.50
Iron rails.....24.50 @ 24.50
Car wheels.....24.00 @ 24.50
Cast borings.....9.50 @ 10.50
Turnings.....14.50 @ 15.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.25; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for car-load lots.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 72½ kgs., \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewnmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Linsed, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c; Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; 2c; 2c; Mineral Sperm, cs, 25½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 50 @ 55c.

CHEMICALS.—Cyanide of potassium, 98½—99%, jobbing, 25 @ 26c @ lb.; carloads, 23 @ 24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½ @ 2½c @ lb.; caustic soda, in drums, 3 @ 4c @ lb.; Cal. s. soda, bbls., \$1.25 @ 1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12 @ 13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; borax concentrated, 7 @ 8c @ lb.; roll sulphur, 4 @ 6c; powdered sulphur, 2 @ 3c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5 @ 7c; chloride of lime, spot, \$2.50 @ 2.75; sulphuric acid, in carboys, 66½ B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, 4c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb. powdered, 9 @ 12c; fused, 25 @ 30c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—Pure, 10 @ 11c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

SODIUM.—Metal, 10 @ 11c.

MERCURY.—Bichloride, 10 @ 11c.

PHOSPHORUS.—(American) 10 @ 11c.

SILVER.—Chloride, 10 @ 11c; nitrate, 55c.

URANIUM.—Oxide, 10 @ 11c.

ZINC.—Metallic, chemically pure, 10 @ 11c; dust, 10 @ 11c; sulphate, 10 @ 11c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

SITUATIONS WANTED.

ANALYTICAL CHEMIST DESIRES POSITION as Assayer or as Chemist in charge of cyanide plant. Thorough knowledge of cyanide process and treatment of difficult ores a specialty. Highest references. Address "Cyanide," care Mining and Scientific Press, 330 Market St., San Francisco.

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PHYSICIAN DESIRES POSITION WITH MINING company in California. Graduate of University of California. Excellent hospital experience. Please address L., this office.

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WANTED—Some Party for Half Interest, to pay expenses of three practical miners, to prospect in Mexico. Best references given. Address Box 644, Phoenix, Arizona.

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ASSESSMENT NOTICES.

GOLDEN CHANNEL DRIFT MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Butte Creek, Butte County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 11th day of April, 1903, an assessment (No. 3) of one and one-half cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 27 Crocker Building, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 23rd day of May, 1903, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on **SATURDAY, the 20th day of June, 1903,** to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

A. B. PAUL, Secretary.

Office—27 Crocker Building, San Francisco, California.

MARINA MARSICANO GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 20th day of April, 1903, an assessment (No. 35) of five cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 415 Front street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 25th day of May, 1903, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on **MONDAY, the 15th day of June, 1903,** to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. BOVONE, Secretary.

Office—415 Front street, San Francisco, California.

WILLIETTA MINING AND MILLING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Jacksonville, Tulare County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 23rd day of April, 1903, an assessment (No. 6) of one (1) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Rooms 233-234 Crocker Building, corner of Post and Market streets, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 4th day of June, 1903, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on **THURSDAY, the 2d day of July, 1903,** to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

E. McALLISTER, Secretary

Office—Rooms 233-234 Crocker Building, corner of Post and Market streets, San Francisco, California.

NATIONAL CONS. MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Rich Gulch, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 27th day of March, 1903, an assessment (No. 17) of five cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 773 Mission street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 4th day of May, 1903, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on **SATURDAY, the 10th day of May, 1903,** to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

GEO. W. FLEISSNER, Secretary.

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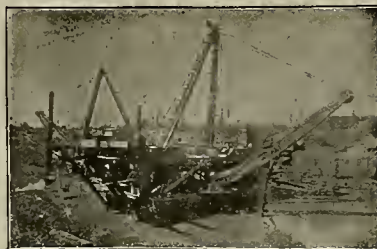
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MINING AND SCIENTIFIC PRESS

Whole No. 2233.—VOLUME LXXXVI.
Number 19.

SAN FRANCISCO, CAL., SATURDAY, MAY 9, 1903.

THREE DOLLARS PER ANNUM.
Single Copies, Ten Cents.

Noted Mines of Yavapai Co., Ariz.

The Iron Queen mine is owned by the George A. Treadwell M. Co., which also operates the Boggs and Hackberry mines. One of the accompanying illustrations is that of the Iron Queen at Mayer. The shaft is 300 feet deep, and there are 2000 feet of drifts on the ledge. The company intends starting up the old Boggs smelter, as well as their new hydro-carbon smelter. They are now laying a pipe line from Crystal Springs to the hydro-carbon smelter, a distance of 9 miles.

The property of the Penn Gold M. Co. is at Walker, about 20 miles easterly from Prescott. W. L. Bell is superintendent. The illustration shows shaft No. 2 of the company. This shaft is down 765 feet. At present they are unwatering the mine, having encountered a very large volume of water which compelled them to install larger pumps. They expect to be able to start operating the mine in a short time. They have 9500 feet of underground workings. Shaft No. 1 is down 554 feet. Both shafts are inclines. All power is generated at shaft No. 2. The plant is equipped with one 132 H. P. and one 100 H. P. boiler, 10x14 compressor and 12x14 hoist. They also have a sawmill in connection with the mine. They mill

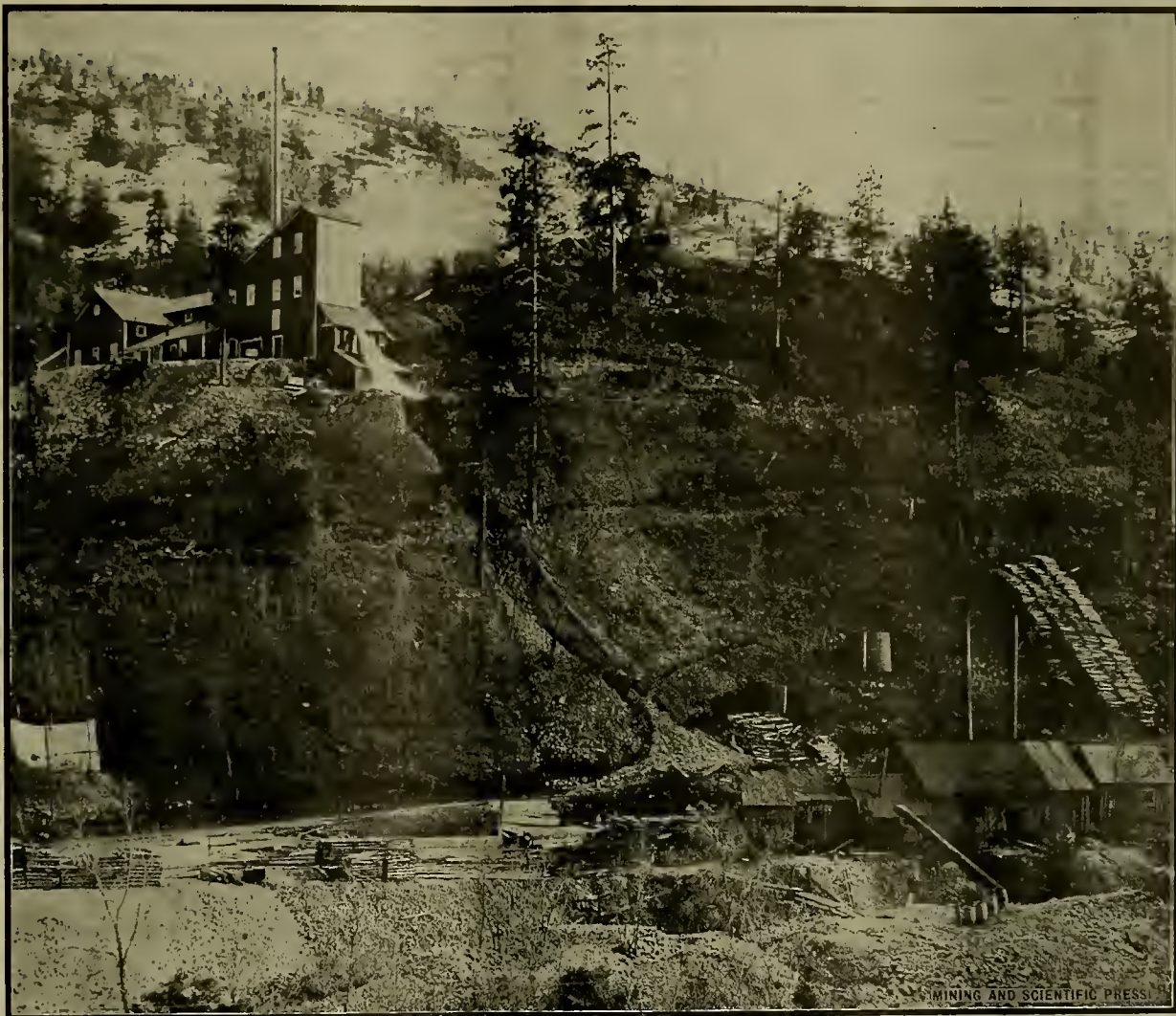
125 to 130 tons per day when operating. The ore is pyrites, galena and blende, which is concentrated. This company has been operating about five years, and in the past has been a dividend payer. The property is located on Lynx creek at Walker, Yavapai county, and is known as the Mud Hole. The illustration shows the water rushing from the bottom of the chute as it was dumped from the skip. Down in the lower righthand corner of the picture can be

seen the power plant and entrance to the tunnel of the Poland M. Co. This tunnel is being driven through the hill to connect with the mill of the Poland Co. at Poland. J. W. Martin is superintendent of the Poland Co.

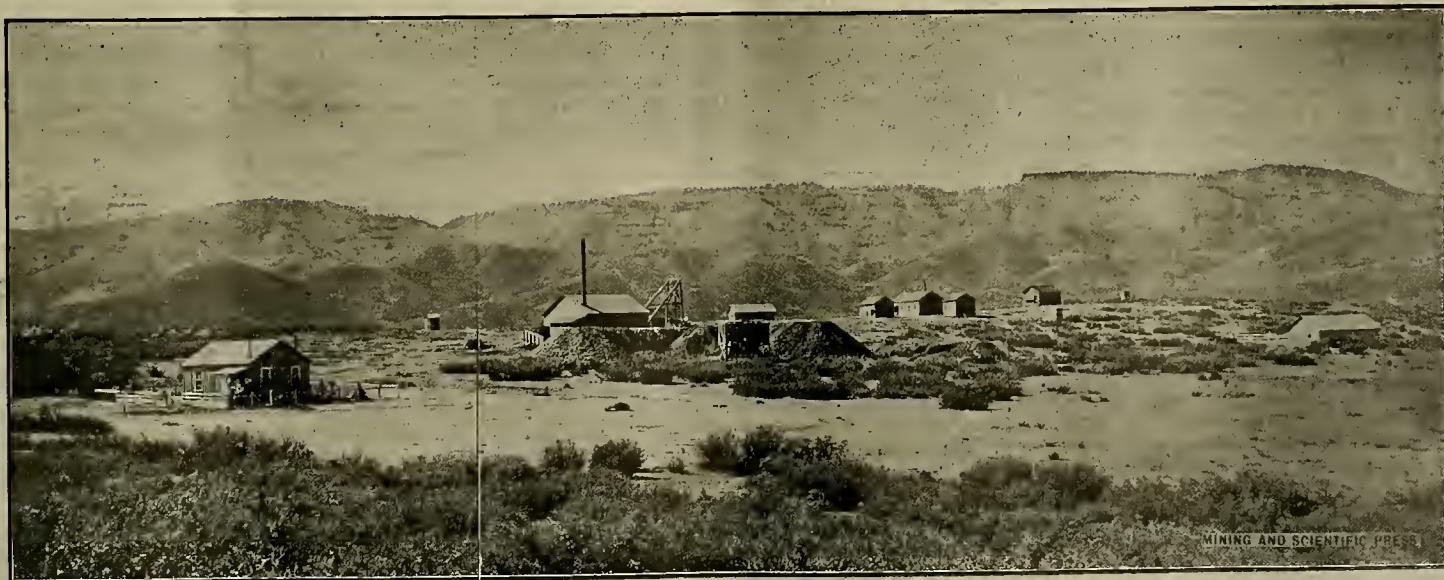
This portion of Arizona is a mineral region of much promise. The rocks are old crystalline schists with many dikes and large masses of igneous rocks. Veins are abundant, and some of them contain high-

grade ores. A few years ago the districts east and southeast of Prescott were idle, the greater part of the veins were undeveloped and many of them were not discovered. Attempts to work the ores had proved unsatisfactory.

The prosperity and active career of the region may be said to have commenced with the opening of the Little Jessie and McCabe mines at Chaparral, which attracted attention to this district.



The Mud Hole Mine, Lynx Creek, Arizona.



The Iron Queen Mine, Mayer, Arizona.

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J. F. HALLORAN..... Publisher

San Francisco, May 9, 1903.

TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
The Mud Hole Mine, Lynx Creek, Arizona.....	294
The Iron Queen Mine, Mayer, Arizona.....	294
Pipe Line, Sea Level Mill, Alaska.....	297
Tramway, Sea Level Mill, Alaska.....	297
Vanner Room, Sea Level Mill, Alaska.....	297
The Batteries, Sea Level Mill, Alaska.....	298
Horizontal Series Two-Step Centrifugal Pump, Direct Connected to Electric Motor.....	299
Vertical Series Three-Step Centrifugal Pump.....	299
Horizontal Series Three-Step Centrifugal Pump.....	299
Canda Cam.....	300
Mining and Metallurgical Patents.....	301
Cutting Off Machine.....	302
Feeding Soap Suds into Cylinder.....	303
Mortar at Foot of Slate Creek Trail, Washington.....	305
Combination Tongs.....	305
EDITORIAL:	
Noted Mines of Yavapai Co., Ariz.....	294
The American Negro for the Rand.....	295
Causes of Mine Failures.....	295
Progress in Electricity.....	295
Miners Want Duty on Lead.....	295
Stage Winding.....	295
Bogus Mining Advertising.....	295
MINING SUMMARY	306-307-308-309-310
LATEST MARKET REPORTS	311
MISCELLANEOUS:	
Concentrates.....	296
The Sea Level Mine, Alaska.....	297
Rock Drills.....	298
Nevada Eight Hour Law.....	298
Holisting Ropes.....	298
The Helena Quadrangle, Mont.....	298
Centrifugal Pumps for High Lifts.....	299
Canadian Geology.....	299
Compressed Air.....	300
Adaptability of the Canda Cam.....	300
Tin in North and South Carolina.....	300
American Capital in Mexico.....	300
Mining and Metallurgical Patents.....	301
Ore Treatment at Mt. Lyell.....	302
The Armstrong Cutting Off Machine.....	302
Oil and Dust From Rock Drill Use in Mines.....	303
Lubricator for Feeding Soap Suds to Compressors.....	303
Were the Nome Gold Fields Previously Worked by Russians?.....	303
The Georgia Gold Belt.....	304
Hydrostatic Level Attained by Ore Depositing Solutions.....	304
A Substitute for Hemp Packing.....	304
Slate Creek Camp, Washington.....	305
Ventilation in Cornish Mines.....	305
Survey in North Carolina.....	305
Useful Combination Tongs.....	305
Books Received.....	310
Catalogues Received.....	310
Personal.....	310
Commercial Paragraphs.....	311
New Patents.....	311
Notices of Recent Patents.....	311

Causes of Mine Failures.

There are many causes for failure in mining enterprises, the principal one being the lack of sufficient valuable mineral in the rock mined to meet the expenses of mining and reduction. Another cause is inexperienced management, that is, a management which is honestly conducted, but which lacks the necessary experience to take advantage of existing favorable conditions, thereby increasing the cost of production to an extent which results in failure. This may be in the mine, in transportation, in the mill or smelter, or it may be in the office. A man who knows no better than to buy heavy railroad picks for underground drift work, and who inquires, on looking over the mine cost sheet, "what are chuck tenders—the men who chuck the ore into the cars?" has no "business" managing a mine. Another cause for failure of a good mine may be found in misdirected management—dishonesty on the part of a manager who combines rascality and technical knowledge to defeat and rob his employer. The latter is too often in evidence. Many mine owners have no practical or technical knowledge of mining and may be easily imposed upon by an unscrupulous superintendent who well knows how to cover the evidence of his dishonest practices and does not hesitate to do it.

Many men who have made a success of commercial business seem not to understand that mining is not as simple as it seems, thinking that it requires neither scientific technical knowledge, nor years of experience to insure success. It is true that there are numerous instances where business men have successfully conducted mining enterprises who had no previous knowledge or experience in mining, but in almost every case the mine has been rich and would have paid with any sort of management, and therefore no particular credit is due to the success of the inexperienced management. There is an aphorism among miners: "Good mines make good miners," and this is true in most cases. Where a poor, low-grade mine is carefully handled at the lowest possible expense, by a careful and experienced man, and still fails to pay, the unfortunate "super" gets few thanks and small credit for his effort.

Miners Want Duty on Lead.

Mine owners of the Slocan and other lead producing districts of British Columbia are endeavoring to have a duty placed on lead imported into the Dominion of Canada, as they claim that the present low price of lead, based on the London quotations, is prohibitory, and the greater number of lead producers in that province are closed for this reason. In the United States lead is quoted at \$3.90@4.37½ per hundred pounds in various parts of the country. The London price is £12 per ton, or about \$2.55 per hundred. From this price is deducted transportation charges, commissions, etc., which leave the miner from \$1.60 to \$1.75 per hundred. In the effort to secure favorable legislation on the proposed tariff the Canadian Government is now being importuned to fix a bounty on lead produced in Canada. This meets with more favor, but the Government wishes this bounty to extend only to lead mined in Canadian mines and reduced in Canadian smelters. As the smelters are to receive the large part of the bonus, the miners are vigorously protesting against the smelter clause, unless the bounty be large enough to give them material aid.

AS in electricity, so in mining, our most recent progress has been more along the lines of improving existing systems and devising new applications than in replacing those systems by newer ones. The present direct current series arc lighting system is similar to that of fifteen years ago, though the constant current machine of 1903 has an enclosed arc. The chlorination treatment of 1892 was but little different except in detail from that of the present, except, of course, that the harrel system has replaced the vat, and liquid chlorine has in some cases taken the place of bleaching powder. The present low voltage incandescent lighting system is but an outgrowth of that devised by Edison, as the present cyanide practice differs from that of eight years ago only in the occasional use of zinc dust instead of zinc shavings, and the different application

of oxygen. The telephone and telegraph differ as little in general application as smelting and leaching of copper ores or stamp mill practice differ from the general principles in vogue a decade ago. The progress in mining, metallurgy and electrical work in the last ten years has been prodigious, but has been more in the perfection of economical detail than in any notable novelty of system.

Stage Winding.

The first mention of "stage winding" for mines worked to great depth, appeared in the issue of the MINING AND SCIENTIFIC PRESS of June 24, 1899. Since then this idea has been greatly enlarged upon by mechanical engineers, but has not yet been put into actual practice. There are many and important considerations in an installation of this character, not the least of which is the cost of plant, but the mechanical difficulties are extreme and it is these that are taxing to the limit the ingenuity of the leading engineers on the Rand in South Africa. Numerous valuable contributions to the literature of the subject have been made, but, although it seems the best solution for reaching a depth greatly exceeding 5000 feet vertical, none of the companies interested have as yet had the courage, apparently, to make a test of relay winding. It is not improbable, however, that some of the deep shafts now sinking, or some among those projected for the deeper levels on the Rand, may undertake the experiment. It is evident that while the engineers have confidence in their mathematical computations of strains, "moments of inertia" and other mechanical features, this confidence is shared in a somewhat less degree by the owners. There is no doubt, however, that the ingenuity of the engineering corps on the Rand will be able to overcome the difficulties which now seem so great. Other problems which seemed equally difficult of solution have been solved in the past, and it is likely that ere long stage winding to a depth of 8000 feet, if not deeper, will be an accomplished fact and considered an ordinary matter. The mines of the Rand and mines elsewhere are going to be worked as long as they will return a profit, no matter what the depth may be. Human ingenuity has surmounted great obstacles in engineering in the past, and it will continue to overcome them in the future.

INGENIOUS advertisements almost entirely devoid of fact continue to appear alluring investors to put money in mining stocks of various degrees of worthlessness; all this being the natural desire of unscrupulous men to get at the savings of the many in these prosperous times; surplus earnings of those who have money to invest, and who are likely to believe the most barefaced statement regarding possible profit in mining investments. There is a constant stream of inquiries as to the merit or lack of merit of mining enterprises widely advertised. St. Louis was long the seat and center of considerable meretricious scheming, but Chicago and Los Angeles seem of late to be favorite ground for some of the most flagrant departures from truth. The latest lead in wildcat mine flotation is to use the names of prominent men in connection therewith. Unthinking readers imbued with the natural desire to believe what they see in print will naturally form the idea that if the Governor or the Senator or the leading merchant who is announced as a director in the prospectus thinks enough of the property to be a director it must be a good scheme. Another bogus proceeding is to take a "mining engineer," to fortune and to fame unknown, announce him as the great, the eminent, the expert of experts, and publish his laudatory letter on the property as a "report." The success of these creatures in inducing investment from ignorant people creates a host of imitators and the whole despicable business discredits the mining industry. Occasionally the Government steps in and secures conviction of one of those bunco men, but the nefarious business goes on. Meanwhile it would seem that any publication pretending to be devoted to mining or any cognate industry should show sufficient interest in the welfare of its readers to exclude from its columns the lying and shameful advertisements of mines and mining stocks that too frequently appear in the advertising columns of publications whose editors certainly know better. There are things in this life besides money.

The American Negro for the Rand.

In view of the shortage of laborers in the mines of the Rand, in South Africa, and the difficulty experienced in securing native labor in Africa, it has been suggested that negroes be secured in the Southern United States to work in these mines. There are many districts in the South where there is a surplus of laborers, and the suggestion is one worthy of consideration; but while the necessary number of men may be secured, if substantial inducements are offered, it is doubtful if the "2 shillings per day and rations," as suggested, would prove sufficiently attractive to these people, but by doubling this sum and providing good and commodious quarters this scheme might be put into practice. There would be several advantages in the employment of the American negro, among which is the ability to speak the English language and an intelligence above that of the natives heretofore employed in the South African mines. A commission has gone to China from the Rand to look into labor conditions there and to investigate the feasibility of securing a sufficient number of Mongolians to supply the present demand, but while it is probable that the necessary laborers could be secured in China, the American negro would probably be superior as a workman, and though demanding a higher rate of wages, he would probably be worth it. Particularly is this the case where the negroes have already had mining experience, as in Tennessee, Alabama and Georgia.

CONCENTRATES.

BLAST FURNACE SLAG mixed while hot with coal tar when laid will form a dustless, mudless road, smooth and hard as stone.

QUICKSILVER is produced at two places under British dominion, Savonas, B. C., and Tellicherry, presidency of Madras, India.

BRICKS found in Chaldean ruins bear the stamp of the makers which indicate that they were made 3000 to 4000 years before the beginning of the Christian era.

CHROMIUM increases the hardness of iron, and perhaps also its tensile strength and elastic limit, but lessens its adaptability to welding. Manganese, like chromium, is a hardener of iron.

MARCASITE—white iron pyrites, cockscomb pyrites—is essentially the same chemical composition as pyrite (FeS_2), but crystallizes in different forms. It has a lower specific gravity, and the color when fresh is paler.

COAL GAS is explosive when mixed with air in the proportion of one volume of gas to sixteen of air. The best mixture to use in an engine is about ten to one of gas, this being but approximate because of different qualities of gas.

The rock specimen from Jackson, Or., appears to be gneissoid granite, but the specimen was too small to make determination positive. Quartz, feldspar and biotite mica are plainly discernible. The rock is unusually fine grained for a granitic rock.

LEAD melts at 608° to 618° F. and tin at 442° to 446° , but an alloy made of equal parts of these two metals melts at varying temperatures, ranging from 370° to 466° F. Bismuth melts at 504° to 507° F., but an alloy made of lead three parts, tin two parts and bismuth five parts melts at 199° F.

An ore deposit lying flat on the summit of a hill, with no other covering than that of superficial debris, is not recognized as a lode or vein; and although valuable in itself, and may be mined or quarried, the locator has no extralateral right—that is, he will be confined to his boundary lines.

The lowest percentage of copper in an ore that will pay is like the smallest amount of gold in ore that can be profitably mined and reduced. No arbitrary limit can be fixed. Each mine has conditions peculiar to itself, and upon these conditions depends, to a great extent, the cost of production.

The only hydraulic suction dredger in use on the Pacific coast, as far as known to "Concentrates," are those of the "Bowers patent" type. The greatest amount of gold produced by a single dredger in one month has not been stated. The dredgers used in gold mining are mostly of the bucket and not the suction type.

INSTANCES have been observed where a dike crosses a vein, intersecting the vein, that a pay shoot has formed in the vein along or near the dike, the latter having had, apparently, a concentrating effect on the mineral solutions. In some mines there are a succession of such dikes crossing the vein with the occurrence of ore shoots at each intersection.

A **GOOD CEMENT** for leather belting is made by working together ten parts of bisulphide of carbon, one part oil of turpentine with gutta percha, forming a thick paste. The leather where the cement is to go should be unrolled and roughed, and when the cement is put on the ends should be pressed together closely till the cement has well dried.

When compressed air is employed in driving a rock drill, it gives up energy in proportion to the work it does, and its temperature is reduced accordingly for this reason. The exhaust of a steam drill is icy cold, ice often forming around the outlet. Machines, pumps and engines using compressed air must be provided with large exhaust, or they will "freeze up."

The term "gneiss" does not denote a rock of some definite composition, but any crystalline rock which has a banded or streaky character is described as possessing a gneissic structure. Gneiss originally was a miners' term for any rock which contained the ore he was seeking. It is a name usually given to rocks of granitic type, but, as above stated, is more strictly a structural term and is applied to many kinds of rock.

The rock specimen from Yale, B. C., is metamorphic. It was probably originally a dark green, basic rock, like some diabase or diorite, which has been compressed and subjected to shearing process, with a further alteration to a calcareous-magnesian rock, in which there is a small percentage of iron sulphide. The sulphide may contain gold or silver, but does not have the appearance or as-

sociation of rich ores of this class. It is not unlikely that in the immediate vicinity from which this specimen came there may be found a further alteration of the rock represented by steatite (soapstone), and it is also possible that in some of the less altered portions of the mass, rock may be discovered which more nearly represents the original rock.

STEEL that has been overheated but not burned may be restored to its former structural condition by heating it to a red heat, not too hot, and keep it at this temperature for ten to twenty minutes, and then allow it to cool slowly. If it has not regained its former characteristic qualities, the process may be repeated, but steel once damaged by overheating or burning can never be fully restored to its normal condition by any known process.

PLATTNER'S test for metallic arsenides, mentioned in "Concentrates," is as follows: Place a fragment of the mineral in a small cup bored in charcoal, and alongside of it a bead of borax; fuse together with a blowpipe at point of blue flame. If cobalt is present, the bead becomes blue. Take fresh borax beads, and repeat operation till, if nickel is present, a brown bead is the result. Continuing, with fresh borax, a blue or red bead shows presence of copper.

APPLICATION for a patent on any mechanical device will be received by the United States Patent Office; but when the device has any feature in its construction for which it is claimed that it is self-actuated—that is, a device which, once set in motion, continues in motion without application of exterior force of any kind—such application must be accompanied by a perfect working model, or the application for patent will receive no consideration.

WHERE one of several co-owners in working on a quartz claim discovers a cross lead or vein the discoverer of such cross vein cannot claim the same as a separate property, but the discovery belongs jointly to all of those interested in the original location. The discoverer of the cross leads may, however, locate a claim adjoining, but outside the boundaries of the original claim, provided he finds the cross lead to extend beyond the side lines of the original claim.

The examination of the geology of a volcanic region for the purpose of determining the probability of the recurrence of volcanic activity is of little value, for there may exist no outward sign of approaching eruption, or earthquake. This has been demonstrated repeatedly in the case of volcanoes long silent and presumably extinct, which have suddenly burst into violent eruption. The instance of the recent eruption of Mt. Pelee, on the island of Martinique, in the West Indies, is a case in point.

The friction in a steam driven air compressor is about 10% of the total horse power required. In a belt driven compressor it is often 5% or less. It takes about 0.2 of 1 H. P. to compress 1 cubic foot of free air to a gauge pressure of 100 pounds, about 0.189 H. P. for 80 pounds, and about 0.159 H. P. for 60 pounds pressure. A compressor to deliver 125 cubic feet free air and compress it to 100 pounds pressure would require 25 H. P., for 80 pounds 23.6 H. P., for 60 pounds of pressure about 20 H. P.

When mine locations are made the locator must so stake his boundaries that they may be readily traced on the surface. This must be done by building monuments of rock, or by setting up a stake at each corner and end center line. A discovery stake must also be set up. Prospectors frequently place their location notice within a tin can or other receptacle, and place it in the location monument in such a manner that it may be secure, but still may be withdrawn and the notice read by those who may wish information.

In judging the color of heated steel, above an incipient red, much depends upon the eye of the observer, and, to a greater extent, it depends upon the degree of illumination under which the observation is made, as the light of an open door or window, or artificial light of any sort. Men who temper steel drills on both day and night shift must learn by experience the effect of the light in which they work. A low, dull red in daylight would look much brighter in the night, and a heated drill which at night showed a ruddy color might look dull blue in daylight.

The principal function of the air receiver as an attachment to an air-compressing plant is to equalize the pulsations of the compressor and lessen the consequent shock. It also serves to some extent as a reservoir, furnishing a supply after the compressor is stopped from any cause. Unless the receivers are large, no considerable benefit may be anticipated, however, for as soon as the compressor stops the air in the compressor if in use continues to flow outward through the pipe line, with constantly diminishing pressure until it has lowered beyond the point of efficiency.

OWING to the decrease in the density of the atmosphere with increase in elevation, an air compressor located at high altitude takes in less air at each revolution. In consequence of this the first part of each stroke of the piston is taken up in compressing the rare air to a

density equaling sea-level pressure of 14.7 pounds per square inch, and the volumetric capacity of the air cylinder is correspondingly diminished. The power required to run the compressor at high altitude is also less than that necessary at low altitude, due to decreased resistance. In view of these facts, compressors are built for high altitudes which have the size of steam and air cylinders proportioned to the existing conditions at the locality where the compressor is to work. Friction in engine and compressor and leakage losses are constant quantities, and do not vary with altitude.

PLACER GOLD, whether in grains of microscopic size or in nuggets worth many thousands of dollars, are all due to a common cause everywhere. Placer gold is derived directly from gold-bearing veins and deposits, which have been disintegrated either by weathering or ground off by ice. Once freed from its matrix, the gold is subjected to abrasion, and the farther it travels from its original position in the vein, the more likely it is to be smooth and have the sharp edges worn off. A particle, great or small, never increases in size by uniting with other pieces. The gold of placers is compact, and any tendency to build up a larger mass by combining with other pieces is not present in gold of that character. To make this possible gold must be pure and in a spongy condition, like dental gold, which is especially prepared for this purpose. It is not necessary, however, that a nugget of gold should travel a long distance to become rounded. It may lodge in some secure position on bedrock, and in flood time the passage of the debris in the stream over the mass of gold soon causes the sharp edges and angles to be worn away, producing a rounded surface.

NATURAL color in water is due to two causes—vegetable stain or suspended matter. When the latter is present in appreciable quantity, it causes turbidity and is not a real pigment. The true color or vegetable stain is greenish-yellow to reddish-brown, and it is due to decayed plant growth; the suspended matter is generally mineral, and often contains iron. The color acquired by water at the bottom of a deep pond is largely due to this cause. A method of stating the depth of color in water is by comparison with a mixture of platinum and cobalt, the color produced by one part of platinum to 1,000,000 parts of water being taken as a unit. The color of surface water depends on the character of the neighboring vegetation and on the time that the water remains in contact with it. Water near steep rocks, where there are few trees, will generally be below 20 units in color; steep wooded or cultivated slopes give 20 to 50 units; similar, but gentler slopes, from 5 to 100; and swampy areas 100 to 500, or even higher. Colored water is gradually bleached by sunlight, the action taking place chiefly within 1 foot of the surface. Most people object to drinking water of a brownish color. In a town water supply the color must be removed or its formation must be prevented. The latter is more economical. Filtering through sand will not remove the color from water, and even clay will take it out but partially. Generally the water must be altered chemically, as by mixture of sulphate of aluminum, which coagulates the coloring matter. The color may also be removed by oxidation, as with potassium permanganate, or by ozone. The question is largely one of aesthetics, as natural coloring matter in water is rarely harmful.

TO **SUCCESSFULLY** smelt fine ore, either raw or roasted, upon a commercial scale, is sometimes done by briquetting. It sometimes happens that the binding material is objectionable. Another method consists in utilizing the fusing quality of bituminous coal, during the process of coking. The combination of coal dust or culm with fine iron ore, and, if desired, the necessary flux, will produce in the coking oven a metallic sponge or coke ready for the blast furnace. Analysis shows carbon 42%, iron 37%, limestone 13%, ash 8%. Analysis of magnetic iron ore before coking: Magnetite 71.08%, silica 22%, phosphorus .03%, titanium 42%. The raw material must be finely crushed and thoroughly mixed before being charged into the coke oven. The gases generated from the coking process, carried on in a retort oven, are recovered and used for fuel in the operation, besides leaving a surplus of about 3000 cubic feet per ton of charge. The time required for coking is twenty-four hours, and for the reducing of the sponge to metal four hours, making a total of twenty-eight hours for the conversion of coal dust and ore into finished metal. It is, of course, apparent that in the production of the sponge, a reduction of the metallic oxides takes place in the coking process, and the metallic sponge is in condition for reduction in the furnaces. The addition of the flux to the sponge is only made if the reduction to metal is to be made in one operation; otherwise it is added in the blast furnace. The production of a metallic sponge containing, say, iron and carbon only, can take place in ovens of any size or make. For the reduction into metal, however, a vertical oven having a capacity of about ten tons should be employed. Such an oven consists of a firebrick shell surrounded by a heating flue wherein the waste gases pass from a combustion chamber under the oven. When the coking process is completed, and while the metallic sponge is in an incandescent state, a strong blast is forced through suitable tuyeres to the interior of the oven, the reduction takes place rapidly and the molten metal and slag are tapped in the usual manner; the oven is then recharged for the next operation.

The Sea Level Mine, Alaska.

Written for the MINING AND SCIENTIFIC PRESS by
W. H. WASHBURN.

The Sea Level mine, in southeastern Alaska, upon which a 30-stamp mill and full mining equipment were completed last year, has been in continuous operation for a year, and the management feels much encouraged by the results of the season's operations. The property is advantageously situated for cheap mining and treatment of ore. The main shaft is about 800 feet from the mill, which is situated on the beach, on a good harbor, which affords accommodation for the largest ocean-going vessels. The mine is located on Thorne Arm, near the extreme southern end of the southeastern panhandle of Alaska, on Revilla Gigedo island, one of the principal islands of the Alexandrian Archipelago. The nearest town of importance is Ketchikan, which is 24 miles distant by water, on the same island. Ketchikan is rapidly growing in population and commercial importance, it being the distributing center of the mining district which bears its name. It is a port of entry and contains public schools, churches, a newspaper and various other institutions which mark the progressive enterprise of the community and the advance of civilization, while merchants and business men carry

which were frequently encountered during those years, and from which large quantities of gold were taken, in the form of wire, leaf, or moss gold.

It is, however, upon the presence of gold-bearing pyrites in its two white quartz veins that the owners of the property will largely depend for their supply of pay ore. The mine is the property of the Sea Level Mining & Milling Co., with headquarters at Seattle, Wash. The mining and milling plant, consisting of a fully equipped 30-stamp mill, hoisting works, air compressor, with machine drills, a water-power pipe line, cable tramway, electric lighting plant and a rock breaker, were installed in the early part of last year.

E. C. Morse represents the Sea Level Mining & Milling Co. at the mine. The ore bodies consist of two parallel fissure veins, which cross a hornblende schist country rock nearly at right angles to its laminations. The two main veins are about 20 feet apart, each having a casing on either wall of the white quartz veins of quartz-porphry averaging about 2½ feet in thickness.

The veins are continuous on the Sea Level claim for over 1000 feet in length. The average width of

eter and the remaining 150 feet is 20 inches. The pipe line is joined by slip joints and wired lugs, and is equipped with three drain valves in the low places and with air valves at the high points. The head of water at the hoisting works is about 85 feet; the head at the mill is about 154 feet. At the shaft house the hoisting works are driven by a 6-foot Pelton wheel with a double nozzle, while the crusher is driven by a 5-foot wheel of the same make.

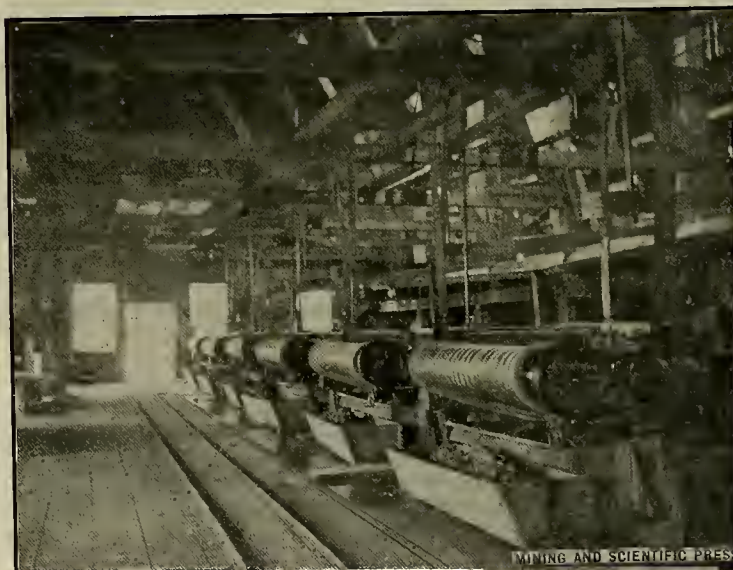
At the mill there are two 6-foot Pelton wheels, one of which drives the batteries and the other the air compressor. There are also two 24-inch Pelton water motors, one of which drives the electric lighting plant and the other the six Frue vanners. The hoisting gear consists of two drums, each 24 inches in diameter, which are connected or disconnected at will with the shaft of the driving pulley. The power is transmitted to the driving pulley, which is about 50 feet distant from the water wheel, by a crossbelt



Tramway, Sea Level Mill, Alaska.



Pipe Line, Sea Level Mine, Alaska.



Vanner Room, Sea Level Mill, Alaska.

on a prosperous and growing outfitting trade with the various mining camps, prospects and fisheries which are scattered over the islands and adjacent mainland for a distance of 70 miles in all directions. Both British and American steamers, bound coastwise, from north or south, come to the wharves and load or discharge their cargoes daily.

The Ketchikan mining district is comparatively new and but little development has thus far been done. It contains some good surface mineral showings and a great variety of ores are present. The various forms of free gold are found in the quartz ledges that lie in the limestones, schists and slates, which also carry gold-bearing sulphides of iron, with occasional streaks of gray copper ore, with high silver values. Chalcopryite ores are also present in large bodies on Prince of Wales and some of the adjacent islands.

The Sea Level mine was one of the earlier properties upon which prospecting operations and preliminary development were undertaken in the Ketchikan mining district. Gold-bearing veins were discovered in the early part of the year 1897 around the head of Thorne Arm. During the following season the Sea Level Mining & Milling Co. began prospecting operations preliminary to the development of the Sea Level and adjoining properties. Considerable attention was attracted to this region during the years 1898 and 1899 by the rich free-gold pockets

pay ore is about 3½ feet on each vein. The gold values are for the most part mechanically associated with pyrites in its various forms, either in the quartz or in the quartz-porphry along its contact.

The mining and milling plant is driven by water power. The water is taken from Gokatcheen creek above its falls, 295 feet above sea level. The water is diverted from the creek by a substantial crib dam, and conducted thence through a short stretch of ditch and flume to the penstock at the head of the pipe line, it being carried to the hoisting works and shaft house through 4400 feet of steel pipe. The diameter of the first 1600 feet of the pipe is 26 inches, the next 1600 feet is 24 inches and the remaining 1200 feet is 22 inches. It is over a rough, undulating country, causing several curves, both vertical and horizontal. Considerable trestle work was also required in its construction. The water is all discharged from the pipe at the hoisting works, that which is not required for driving the hoist and crusher being discharged through a waste pipe controlled by a valve. After the water has been used at the hoisting works, it is collected in a flume and penstock and carried for 850 feet in steel pipes to the mill, where it is used in driving the six batteries of five stamps, a 6-drill Leyner air compressor, six Frue vanners and the electric lighting plant.

The first 700 feet of this pipe is 22 inches in diam-

16 inches in width. In addition to the usual equipment of friction brakes on the hoisting drums, the deflecting hoods over the nozzles are under the convenient control of the engineer, so that the skip or bucket may be lowered at any desired speed with safety by simply deflecting the nozzle sufficiently to permit the water wheel to run backward against a part of the jet of water from the nozzle.

The shaft is of three compartments, each of them 4 feet 8 inches by 5 feet. Two compartments are equipped with guides, the middle compartment being used as a skipway and the southern compartment as a bucketway.

In the northern compartment is the pump, manway and air pipes.

At the bottom of the shaft is a small duplex Snow pump, which keeps the sump clear of water, pumping at the rate of about twenty gallons per minute. The ore is dumped from the skip on grizzlies over the ore bin, which has a capacity of 200 tons. That passing over the grizzlies falls on a steel-covered floor, from which it is put through an Austin No. 3 gyratory crusher placed over the bin. Some of the waste rock is here sorted out of the ore and run out on the waste dump. The rock crusher is driven by Manila rope transmission from the water wheel, which is about 90 feet distant from the counter shaft which drives the crusher. This counter shaft also drives,

or, rather, controls the tramway by a belt to its head gear. The tramway is 689 feet long, 428 feet of which has a 12½% and 261 feet a 23% grade, beside a lateral curve around which the cable is guided by sheave wheels. The cable is of steel wire, 4-inch diameter, endless running over two three-grooved sheave wheels at the head gear and over two single-grooved sheave wheels on a tension-weight box at the lower end. The cars are attached to the cable by means of a specially designed grip, which holds them securely and releases them automatically at the foot of the track. The motion of the cable being controlled by water power, as before stated, the cars are lowered with a much more regular speed than would be possible if gravity alone were used. A brake and clutch at the head gear give the operator perfect control of it. The cable runs one way, only stopping as the light car arrives at the top, a loaded car having gone down at the same time. An iron tailpiece drags behind the light car as it comes up the track, in case a grip should get loose; but this has not happened as yet.

The shaft is about 110 feet deep. At a depth of 50 feet there is a prospecting level, which was driven during the period when the earlier developments were in progress. At a depth of 110 feet there is over 1000 feet of drifts and crosscuts on the two veins, each of which have cartracks of 12-pound T-rails, over which Truax underground ore cars are operated. Ore is being drawn from a number of stopes, and though there is much ground that remains yet to be stope out on this level, the owners

tion to be well adapted to the successful treatment of the ores from the Sea Level mine. The tailings from the mill rarely exceed 25 cents per ton. Results from the Sea Level mine have been watched with great interest, because of it being one of the most extensively developed properties and the first upon which the erection of a well equipped plant of modern mining and milling machinery was undertaken in the Ketchikan mining district.

Rock Drills.

In making up power drills, it is the general custom throughout this western section to weld the fluted steel for hits to octagon shanks, says a writer in Sparks from the Anvil. There are but few places where the entire length of the drill is made of the fluted bar. The reason for this is that in the western country the rock is very much broken up as a general thing, throughout the mountains, and a great many seams and crevices are encountered which cause the drills, at times, to run sidewise and make it almost impossible to drill a straight hole. Where the hole becomes crooked the fluted steel binds, the flutes catching in rotating the drill, which causes trouble, while on the other hand an octagon or round shank can be made to turn, though it should bind in places.

In hardening the bits of power drills, I do not advocate drawing tempers, for the reason that there is always more metal in the center than in the wings, and where the temper is drawn in the ordinary way

dressing these drills for use in hard rock, I advise leaving the corners perfectly square across the edge of the rib, and that they be hardened back at least 1 inch from the edge, the hardening to be done at the lowest heat at which they will harden to the right degree.

In the lake region, when I visited that section, they seemed to have the hardening of this class of drills down to about as perfect a system as anywhere, particularly at the Republic iron mine, where the rock was excessively hard. Mr. Miller, who had charge of this class of work at that mine, never allowed the same person that dressed the drills to have anything to do with hardening them, but they were passed to a man whose duty it was to do that part of the work, this man being provided with a reheating furnace arranged similarly to a hot-heading furnace, in which the drills could be given a short heat and just as desired.

Nevada Eight Hour Law.

The eight hour law passed by the last Legislature of Nevada went into effect on April 25. The full text of the Act is as follows:

Section 1. The period of employment of workingmen in all underground mines or workings shall be eight hours per day, except in cases of emergency, where life or property is in imminent danger.

Section 2. The period of employment of workingmen in smelters and all other institutions for the reduction or refining of ores or metals shall be eight hours per day, except in cases of emergency, where life or property is in imminent danger.

Section 3. Any person who violates either of the preceding sections of this Act, or any corporation, employer or his or its agent who hires, contracts with, or causes any person to work in an underground mine or other underground workings, or in a smelter or any other institution or place for the reduction or refining of ores or metals, for a period of time longer than eight hours during one day, unless life or property shall be in imminent danger, shall be guilty of a misdemeanor, and upon conviction shall be punished by a fine of not less than one hundred (100) dollars, nor more than five hundred (500) dollars, or imprisonment in the county jail not more than six months, or by both fine and imprisonment.

Section 4. This Act shall take effect sixty days from and after its passage.

Hoisting Ropes.

Owing to the difference in ropes and the conditions under which they work there has been much confusion about the initial factor of safety.

The point where hoisting ropes most frequently give out is at the point of connection to the skip, where the factor of safety is much higher than where connected to the drums. For a 2000 feet rope of uniform section, for example, with a factor of safety of 7 at the drum, it would be 9½ at the skip. For a much greater depth, where taper ropes would be needed, such a ratio of factors at the top and bottom should suffice. It is evident from the foregoing that for 2000 feet a taper rope would not be advisable; and this might apply to still greater depths of, say, perhaps even 3000 feet. Corrosion is generally more active with ropes in inclines, since they are more liable to pick up moisture from the ground and drippings from the roof.

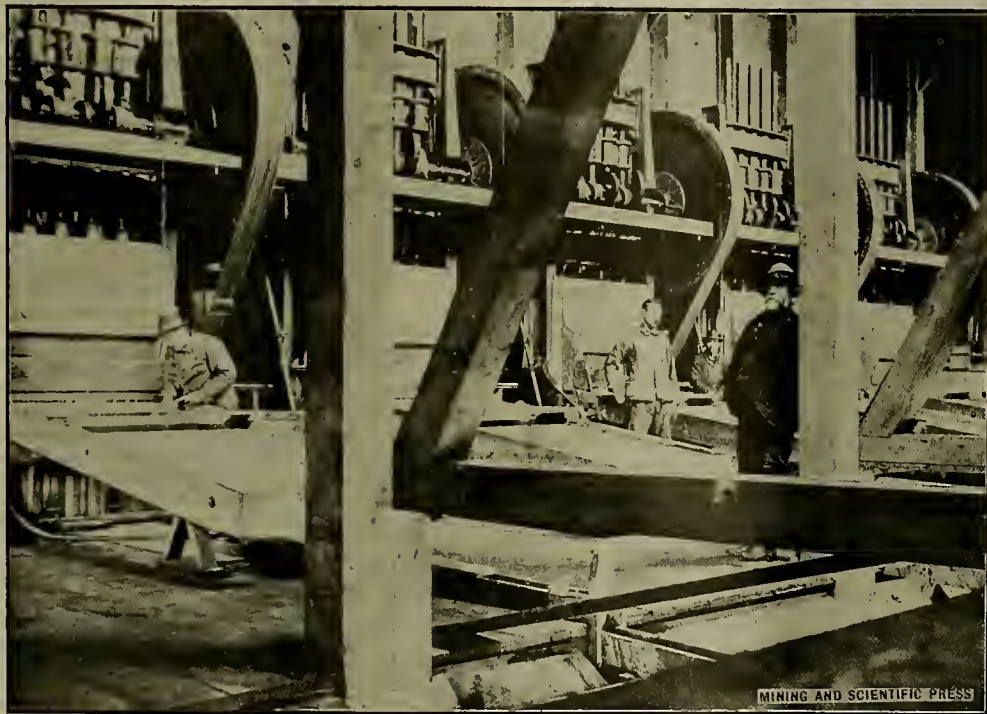
The factor of safety in a hoisting rope can evidently be taken lower for a rope which is not allowed to run for a long time than for one in which a long life is required. It would probably not be advisable to make a definite time limit for the use of ropes, not only because ropes operate under such different conditions, but also in view of the improvements which are constantly being made in the manufacture of materials for ropes, as to their wearing qualities and the devices that may be discovered for preventing corrosion.

The Helena Quadrangle, Mont.

A new and revised edition of the map of the Helena quadrangle, Montana, has been prepared by the United States Geological Survey. This map shows the results of the latest surveys in the most important mineral region of Montana.

Since the map was first prepared, fifteen years ago, the region has increased so much in importance that new surveys on larger scales have become necessary. This demand resulted in the making of the Butte Special map on a scale of about 1200 feet to 1 inch, which has been published, together with descriptive text and geological sections, as the Butte Special Folio, No. 38. Later the Boulder sheet, which represents the southeast quarter of the Helena quadrangle, was issued on a scale of about 2 miles to 1 inch. Next followed special maps about Helena and Marysville on larger scales.

These new maps have been reduced to a uniform scale and used as corrections to the old Helena map. The changes between the old and the new maps due to increase in population are particularly noticeable, and show in a graphic manner the growth of the country.



The Batteries, Sea Level Mill, Alaska.

of the property are contemplating sinking a shaft to an additional depth of 300 feet. The mine is equipped with four No. 3 and one No. 2 Leyner rock drills and one Ingersoll-Sergeant 3-inch drill. The air is furnished by a 6-drill Leyner compressor, driven by a belt connection with a 6-foot Pelton water wheel, which is located at the mill.

Truax ore cars carry the ore, loaded from the chutes in the ore bin at the shaft house, over the tramway to the mill, the latter having a capacity of 300 tons.

From the bin at the mill the ore passes through six Challenge ore feeders to six self-contained iron-frame batteries of five stamps of 1000 pounds each. The mortars are iron, with hack coppers and chucks.

Forty-mesh angle-slot screens are used, and the pulp which issues passes over silver-plated copper plates and the Frue vanners.

The ore from the Sea Level mine has proven amenable to treatment by amalgamation; though the values are largely associated with sulphides, more than 70% of the gold is recovered from the ore by amalgamation alone.

The tailings from the plates pass over six Frue vanners, which are situated on a floor below the battery floor, where the sulphides are concentrated and the tailings washed into the bay.

Light is furnished for the entire mining and milling plant, office, boarding house and other buildings by an electric lighting plant with a capacity of 100 16 C. P. incandescent lamps. There is a postoffice at Sea Level, and a regular mail is brought once each week from Ketchikan.

The transportation requirements of the Sea Level mining and milling operations are served by a gasoline launch of fifteen tons. The operation of the plant has been successful and given little trouble, it having proved by nearly a year's continuous opera-

the center will run out long before any colors show on the corners of the wings—a condition which causes a heavy strain by contraction and expansion, making the corners liable to crack; besides, the center, in hard rock, is liable to chatter.

The best method, to my notion, for hardening these drills, is to forge them and let them cool, then heat them short and plunge, keeping them in the bath long enough to thoroughly harden the bit, then withdraw them from the water and stand them on the damp ground. This holds the edge hard, and at the same time allows the heated portion back of the hit to cool gently, thus toughening and strengthening it.

The trouble I have found in hardening direct from the anvil at the same heat as the dressing heat, is that in most cases the steel is heated too hot, for while the outside may appear to be at about the right heat for hardening, the center is much too hot, and when plunged the bit is liable to burst in the corners of the wings.

Another reason why I advocate plunging this class of drills and giving them full hardness, instead of drawing the temper, is, that machine drills churn backward and forward in the hole, which subjects them to constant wear, so that, if not very hard, they soon lose their gauge. We have found in the excessively hard rock of British Columbia that even before the edges are dull the drills become too dull from this grinding action.

I may say in this connection, that while it appears more mechanical to round the corners of the wings, at the point, to the curvature of the circle that the bit would make, we have found that they hold their gauge much longer and work fully as free if the outer edge of the point is made square. The hard, square corners, it can readily be seen, will grind for a considerable time before wearing down so as to affect the actual size of the bit.

In all cases now where I give any directions for

Centrifugal Pumps for High Lifts.

Hydraulic engineers and miners have been slow to recognize centrifugal pumps as a medium for delivering water at a height of over 40 feet. Direct-acting steam pumps and geared, plunger pumps, up to within the last year or so, were the only known devices for raising water to elevations from 100 to 1000

maintenance to a minimum. The Byron Jackson Machine Works, 411 Market street, San Francisco, Cal., have designed and patented a centrifugal pump for raising any quantity of water to heads of 1000 feet or more.

Figure 1 is a cut made from a photograph of a series two-step centrifugal pump specially designed for the city water works of Fort Worth, Texas, and consists of two units of 5,000,000 gallons capacity

in the bottom of the shaft 80 feet below the surface. Each pump is driven by a rope transmission system from the engine at the top. An official test of this plant showed that a single engine with its pump raised 6,500,000 gallons in twenty-four hours to an elevation of 106 feet, the pump giving an efficiency of 80%. The cost of repairs on this plant is shown in a letter dated April 2, 1901, from the City Council of Rockford, signed by E. W. Brown, Mayor, saying: "The vertical engines and centrifugal pumps have been in constant use since August, 1898, and have not as yet cost this department a single dollar in repairs."

Canadian Geology.

Written for the MINING AND SCIENTIFIC PRESS by H. F. EVANS.

Briefly, Dominion geology may be divided into five districts, or rather regions, viz: Acadian, which comprises the maritime provinces Nova Scotia, New Brunswick and Prince Edward Island, to which may be added Newfoundland; the Laurentian lowlands, which extend from Anticosti west to the city of Quebec, and Lake Huron, including the Huron-Erie peninsula of Ontario, southeast of Ontario, the Ottawa Paleozoic basin, and the flat-lying Paleozoic sediments of the Province of Quebec; the Laurentian highlands, including the great peninsula of Labrador, to the east of Hudson bay and the country to the west and northwest of the same bay; the interior continental plain which runs north from the 49th parallel towards the Arctic ocean and embraces Manitoba, and what are known as the Northwest territories, including the districts of Athabasca, Mackenzie and the great undefined north, and the Cordilleran, or British Columbia region, which extends across the Rocky mountain system of Canada from the foothills to the Pacific ocean, including the great Cordilleran belt from the 49th parallel to Alaska.

The Dominion Geological Survey has a classification of its own. It is something like the following:

Quaternary.	Silurian.
Tertiary.	Ordovician.
Cretaceous.	Cambrian.
Jurassic.	Huronian.
Triassic.	Laurentian.
Permian.	
Carboniferous.	
Devonian.	

Of the 3,616,980 square miles of territory in British North America nearly two-thirds belong to the Archæan. The term is understood to embrace both the rocks of the Laurentian and those of the Huronian systems. The Laurentian constitutes the fundamental or older series in the Archæan.

The greatest activity reached by the Dominion Geological Survey in the Cordilleran region was during the preliminary survey of the Canadian Pacific Railway, its actual construction, and for several years afterwards. The death of Dr. Dawson, chief of the Geological Survey, appears to have checked, to a considerable extent, the energy and enterprise of that department. The Canadian Government has not yet appointed a successor to Dr. Dawson. At present there is only an acting chief—Dr. Robert Bell, who fills that position, was for a number of years a member of the Dominion Geological Survey.

A more down to date system has been advocated by the Progressive party in the Dominion and many radical changes have been suggested. It has even been urged to adopt the American system of classification and nomenclature, but this does not find favor with the old school, especially the old school geologist, who, in the Dominion, is not only strong in numbers, but in his political pull.

It seems to be a disputed point among Canadian geologists, whether or not the Carboniferous is represented. According to Dawson it is "largely represented," but members of his staff who have made examinations from time to time maintain that there are only altered representatives of this formation. As

there is no geological society in British Columbia, and as the Dominion is a large country, and the Geological Survey Corps comparatively small and the appropriation inadequate, it will probably remain for American geologists and mining men to determine the disputed problem.

It is officially stated with regard to the Cordilleran region that, in the Kamloops district of British Columbia and in the West Kootenay, Dr. Dawson recognized a Cambrian horizon in dark argillites 15,000 feet in thickness, which are superimposed on 25,000 feet of volcanic rocks described as the Adams Lake Series.

In the Rocky mountains members of the Geological Survey have described Lower, Upper and Middle Cambrian sedimentaries. In the Castle mountain group in the Bow River Series and near Donald limestone

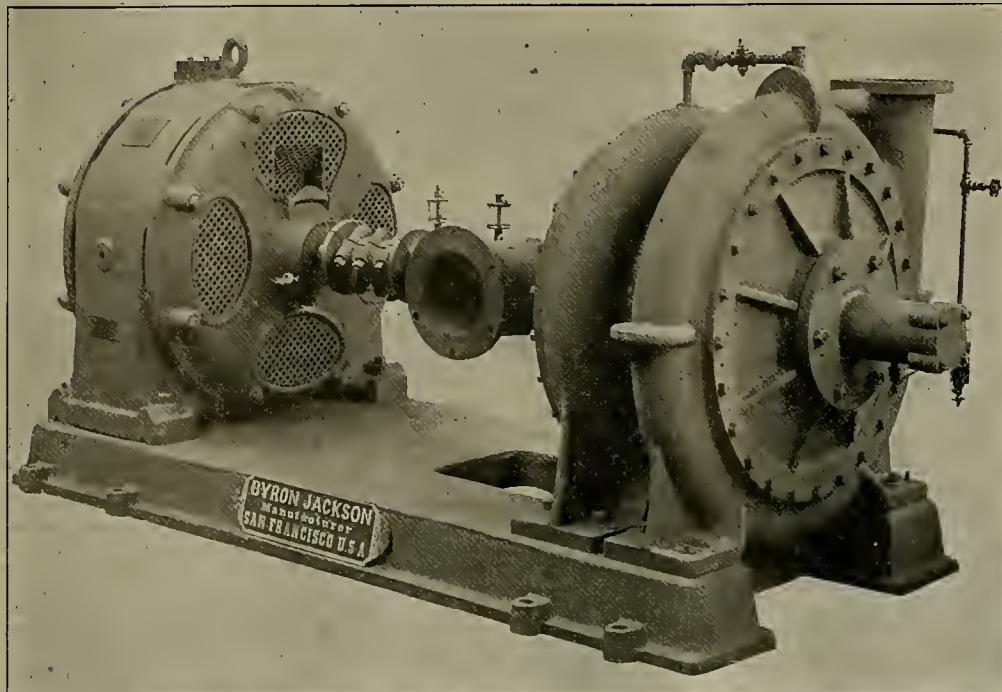


Fig. 1.—Horizontal Series Two-Step Centrifugal Pump, Direct Connected to Electric Motor.

feet. On account of the heavy expenditures for repairs of direct-acting pumps owing to excessive wear on piston and valves caused by muddy or gritty water, there has been a long-felt need by

each per day. The shaft is 170 feet in depth; from the bottom of this shaft tunnels radiate to several wells from which the pumps receive their supply and the water elevated to a reservoir on the surface at a total lift of 200 feet. Figure 2 represents a vertical series three-step centrifugal pump for the city water works of New Albany, Ind., and consists of duplicate pumps, each of 2,000,000 gallons capacity per day and each driven by a 200 H. P. induction motor, direct connected by means of a vertical shaft extended to the surface. The pumps are set up in a cylindrical pit 14 feet in diameter and 30 feet deep. The balancing device is designed to carry the weight of the shafting, together with the rotor of a 200 H. P. motor. The pumps are expected to raise water from the several bored wells and force it through the mains into a reservoir against a total head of 310 feet. Centrifugal pumps for placer mining have been introduced and have proven to be the means of opening up many placer mines that otherwise could not have been worked, there being no other means at hand by which the gravel could have been removed and at the same time obtain sufficient

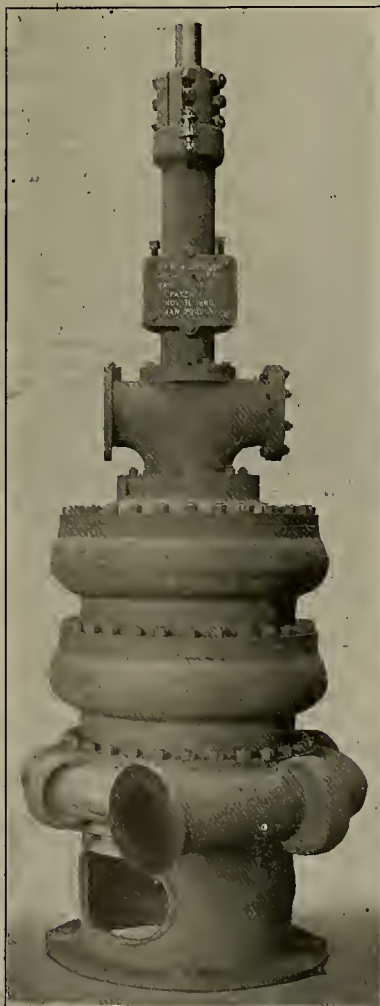


Fig. 2.—Vertical Series Three-Step Centrifugal Pump; 1500 Gallons Per Minute; 310 Foot Head.

engineers for an economical pump that could be adapted for any quantity of water at heads ranging from 100 to 1000 feet and over, for city water works, draining mines, creating pressure for hydraulicking, etc., and reduce the expenditures for

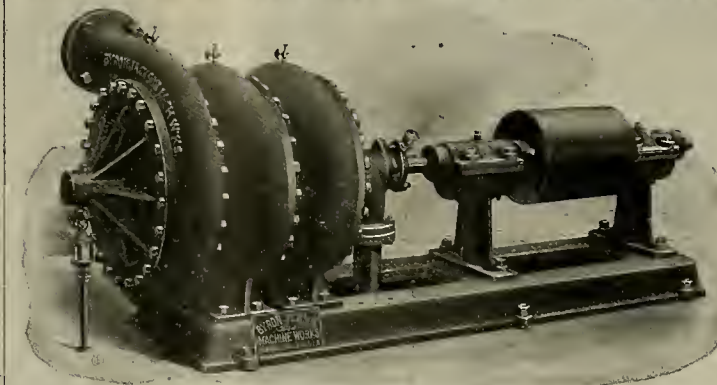


Fig. 3.—Horizontal Series Three-Step Centrifugal Pump; 1000 Gallons Per Minute; 520 Foot Head.

water for sluicing. Figure 3 illustrates this style of pump and is designed to raise 1000 gallons per minute to an elevation of 400 feet through a giant having a 2-inch nozzle, creating a hydraulic pressure at the nozzle of fifty pounds, making a total working head on the pump of 520 feet. Official tests show 80% to 84% on these centrifugal pumps, which the manufacturers say are taking the place of direct acting pumps for city water works—the first cost being less, producing a higher efficiency, and cost of repairs reduced to a very small item.

In 1893 the city of Rockford, Ill., installed for the city water works a complete plant consisting of three special designed centrifugal pumps and three Jackson vertical compound condensing engines with cylinders 9x15 inches and 15x15 inches running at 210 revolutions per minute. The pumps were placed

slates and sandstones contain fossils which have determined a Lower Cambrian, a Middle Cambrian and an Upper Cambrian. In the Yale district, where I have spent some time examining the formation, schists, sandstones, argillites and limestones constitute the Cambrian of the southern interior. The Cambrian strata of Mount Stephen, along the line of the Canadian Pacific Railway, are exceedingly fossiliferous and are rich in Neo-Cambrian trilobites, these are found abundantly at an elevation of 11,000 feet.

Compressed Air.

Reference has been made to the use of compressed air and its facility of adaptation to various requirements; but it is evident, from an inspection of some of the devices in use, that enthusiasm for new methods, rather than good judgment, has prevailed in many of its applications. For some years compressed air was used only in mines, where it produced marked economies. Later, it was introduced into manufacturing lines, and to-day its use in railway and other machine shops, boiler shops, foundries and bridge works is being widely extended, says Prof. Flather in Cassier's Magazine.

The air is used to operate riveting machines, punches, staybolt breakers, rotary tapping and drilling machines, fine rollers, rotary grinders, rotary saws, pneumatic hammers, chisels and caulking tools, flue welders, boring and valve-facing machines, rail saws, machines for revolving driving wheels for setting valves, pneumatic painting and white-washing machines, dusters for car seats, and the operation of switching engines about the yard. It is also used in the foundry for pressing and ramming moulds and for cleaning castings by the sand blast; but its greatest field of usefulness is its application to hoisting and lifting operations in and about the works.

New applications of compressed air are constantly being made, and each use suggests another. This has a tendency to increase the number of applications which are intended to be labor-saving devices, but in many cases the work could be done just as well and much more cheaply by hand.

A case in point is seen in an apparatus which was at one time in use on one of the more prominent railways. It was a sort of portable crane hoist which could be fastened to the smokestack of a locomotive whereby one man could lift off the steam chest casings. The hoisting apparatus weighed about twice as much as the steam chest and took three men to put it up. When piece work was adopted two men easily lifted off the steam chest, and this "time and labor saving device" was relegated to the scrap heap.

While compressed air has been used, to some extent, for inducing draught in forge fires, it is unquestionably a very expensive agent for such work. Tests have shown that it costs twenty-five times as much to produce blast in that way than it would with a fan.

The success and economy which have attended the use of compressed air in so many lines of work have led to its adoption in fields which are much better covered by electrically operated machines. While compressed air has been used very satisfactorily under certain conditions to operate pumps and engines, printing presses, individual motors for lathes, planers, slotters, dynamos and other work, it does not follow that it is always an economical agent for these various uses, or that other methods could not be used even more satisfactorily in a majority of cases.

It has been proposed to use individual air motors in machine shops and do away with all line shafting except possibly for some of the heavier machinery. This use of compressed air seems entirely outside the pale of its legitimate field. General experience thus far indicates that rotary air motors are not at all economical, and generally are not as satisfactory as electric motors. Exceptions are to be found in the small portable motors for drilling and similar operations to which electricity is not well adapted. The saving obtained by the use of such portable air drills, as compared with a hand ratchet drill, is very marked.

Although these tools are very successful, they are still rotary motors, not exempt from some of the objectionable features which seem to be inseparable from them. It is not surprising, therefore, to find a tendency to employ reciprocating pistons and cranks in these portable machines, and there are such tools weighing only forty pounds, capable of drilling up to 2½ inches diameter.

In most cases no attempt has been made to use the air efficiently; its great convenience and the economy produced by its displacement of hand labor have until recently been accepted as sufficient, and greater economies have not been sought.

In the matter of compression we still occasionally find very inefficient pumps in use, but manufacturers generally have learned that it pays to use high-grade, economical compressors. The greatest loss is that in the air motor itself. In a large number of cases it is impracticable, or, at most, inconvenient to employ reheaters, and we find very generally that

the air is used at normal temperatures for the varied purposes to which it is applied.

To obtain the most satisfactory results, the air must be used expansively; but usually where the demand for power is intermittent, no attempt has been made to reheat the air, and as a result the combined efficiency of compressor and motor is quite low, varying in general from 20% to 50%. While low working pressures are more efficient than high, the use of such pressures would demand larger and heavier motors and other apparatus which is undesirable. The advantages of higher pressures in reducing cost of transmission are also well recognized, and the present tendency is to use air at 100 to 150 pounds instead of sixty or seventy pounds of a few years ago.

By reheating the air to a temperature of about 300° F., which may often be accomplished at small expense, the efficiency is greatly increased; in some cases the increase has been found to be as high as 80%. While the lower pressures are yet more efficient, the loss due to higher compression is not serious.

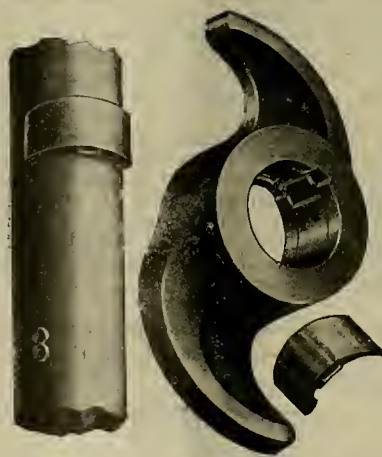
If air be used without expansion, there is a material loss in efficiency; but, on the other hand, if it be used expansively without reheating, trouble may be experienced from drop in temperature below the freezing point. With moisture present, this drop will cause the formation of ice, which may clog the passages if proper precautions are not taken to prevent it. The low temperature will not in itself cause trouble; if, therefore, the moisture which the compressed air holds in suspension be allowed to settle in a receiving tank, placed near the motor or other air apparatus, and frequently drained, trouble from this cause will be largely avoided.

While it may be impracticable to reheat the air in certain cases, yet there are many situations where a study of means to overcome the losses referred to would result in marked economies.

The greater adaptability of compressed air to various purposes causes its use to increase along with that of the electric motor, for it has a different field of usefulness, independent of power transmission; at the same time, when the requirements are properly observed in its production and use, its economy as a motive power in special cases compares favorably with that of other systems. With a better knowledge of the principles involved, we may expect much better results than have yet been attained.

Adaptability of the Canda Cam.

It is a mistake to think that the Canda self-locking cam can only be used in connection with a specially sized and shaped cam shaft. The change can be made from any of the old style keyed cams to the Canda without the necessity of buying a new shaft. These cams are made with bores of a number of different diameters, so that, whatever the size of the shaft, it can be fitted. The holes for the studs can be drilled with an ordinary ratchet drill, the positions for the studs being determined by a templet, which the manufacturer will furnish, it being necessary only to state the order of drop, diameter of shaft, and whether for five or ten stamps or a single shaft. The accompanying cut shows the device by which the cam is made



Canda Cam.

self-locking, being a gib which fits inside the cam, and is simply a wedge onto which the cam is forced by the weight of the stamp and tappet as they are raised. The tightening action is continuous as long as the stamps are in operation. The thin end of the wedge is pointed toward the point of the cam arms, and the gib being held in position on the shaft by the studs, which fit in the keyway in the under side of the gib. To loosen the cam, a few blows on the reverse side of the arm will force it back readily. For this a heavy hammer is better than a light one, as a light hammer tends to crystallize any steel. Being made of chrome steel, the manufacturers say they are practically unbreakable by this treatment; however, a block of wood placed on the cam when being hammered lessens the liability of damage occurring. These cams are cheap, costing but little more than

the keyed cams, and are manufactured by the Chrome Steel Works, Brooklyn, N. Y., G. W. Myers, Haywards Bldg., San Francisco, Cal., being Pacific coast agent. Along the Mother Lode district of California there are over 400 Canda self-locking arms, both in use and being put in.

Tin in North and South Carolina.

Written for the MINING AND SCIENTIFIC PRESS.

The existence of cassiterite in the region of King's mountain, North Carolina, has been known for twenty years.

Crystals of cassiterite, many of them an inch in length, have been picked up in the clay soil in the neighborhood of King's mountain and even on the streets of the village of King's Mountain, particularly after heavy rains. This led about ten years ago to active prospecting for tin veins. It was found without difficulty in many small pegmatite dikes quite common in the granite area of this region. Finally efforts were made by competent mining engineers to obtain the tin on a commercial scale. For this purpose a 10-stamp mill was erected, and after stamping the tin-bearing pegmatite, a Frue vanner was used to separate the heavy cassiterite. These efforts were abandoned, however, not so much on account of the small percentage of cassiterite obtained as for the reason that the great proportion of mica in the pegmatite filled up the mortars, forming cushions and making it difficult to crush the quartz and feldspar. Another effort to exploit this tin area was made about five miles east of the village of King's Mountain, possibly eight years ago. On sinking a shaft on the supposed vein it was found that the granite in this place contained more manganese than tin, and much of the supposed tin ore was worthless tourmaline.

Within the last two months other veins have been found, presenting a more fascinating proposition for development. They show that the region containing tin is larger than had been supposed.

It should be noted that the isolated peak, called King's mountain, rising 4000 feet above the surface of the Piedmont plateau, in Gaston county, on the southern edge of North Carolina, is simply a part of the great granite area which characterizes the Piedmont plateau in this region. Extending northeast and southwest, on the southeast flank of the mountain, is a bed of limestone extending nearly to the summit. This limestone is also a characteristic feature of the Piedmont plateau, for many miles on the southeast flank of the granite. On its western edge it has been locally changed into marble. The junction of the granite and limestone is noticeable at Gaffney, in Cherokee county, South Carolina, near the North Carolina boundary.

About 1½ mile northeast from the town of Gaffney, and well into the granite are two parallel ridges of apparently fine-grained granite. Included between them, running the usual northeast and southwest direction, is a bed of red clay, interspersed with veins of kaolin, apparently a thoroughly decomposed pegmatite dike, perhaps 70 feet in width. Little effort has been made to determine its length. Through this clay crystals of cassiterite have been found in considerable quantity, so that it is hardly possible to pan the clay at any point without obtaining plentiful traces of cassiterite. Frequently the streaks of kaolin, in the red clay, contain more than half their weight of cassiterite. This clay has been prospected by trenches, by the owner, S. S. Ross, and in this development work he has gathered some three or four tons of fairly pure cassiterite, containing occasional bits of magnetite. The decomposed area containing tin ore is so large as to render washing operations for saving placer tin profitable. Water could be obtained about 10 miles away with sufficient head for hydraulicking. A smaller creek will furnish enough water for working a force pump against the face of the clay, a more economic method of prospecting the property. Arrangements for this form of development are now in progress. The interest aroused by this discovery has led to opening up at least half a dozen other pegmatite dikes, all containing more or less cassiterite, but not essentially different from those which years ago failed to maintain the interest of their developers. The ore strongly resembles the greisen of some of the Black Hills tin mines, although usually more decomposed.

The clay found by the writer also showed an appreciable amount of monozite.

American Capital in Mexico.

American capital is being attracted to Mexico by the unusual opportunities for profitable investment. Money invested there undertakes and performs things in a more economical manner than the Mexicans themselves have usually accomplished these things, and with better results. American engineers and American machinery have opened a new field in old mines. The Mexicans worked the mines to water level. When this was reached the limit of their resourcefulness was also reached, unless the workings could be drained by long tunnels, driven to reach the vein beneath the lowest work-

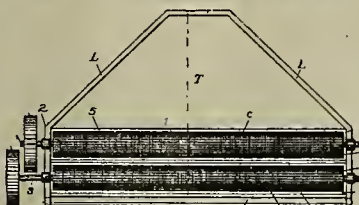
ings. American miners have taken many of these same old, abandoned mines and by installing suitable machinery have been enabled to work some of them with great profit. The mineral resources of Mexico are undoubtedly extensive, as has been proven by the past history of its mines, but a new era has commenced for Mexico, and it is not extravagant to say that her mineral wealth is only beginning to be appreciated by Americans. Mexico has produced hundreds of millions of ounces of silver. A Mexican authority has placed the production at \$3,000,000,000 and an impression seems to prevail that the mineral wealth of that republic consists principally of silver mines. This is not the case, for there are also extensive mines of gold, and these are constantly receiving more attention, particularly in the United States since the great depreciation in the price of silver. The latest statistics available place the yield of gold in 1900-01 at \$9,250,000. The output for 1902 has not yet been published, but it is thought it will show an increase over the former period. American capital is largely responsible for this increase in the gold output. Modern methods and American machinery have rendered the low-grade ore deposits available, as well as those of high grade, which latter in previous years attracted the greater attention. It is due to the low-grade gold mines that Mexico's gold output is on the increase. There are hundreds of thousands of tons of tailings which will be treated by the cyanide process, which will help to swell the output in no small degree.

Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 25, 1903.

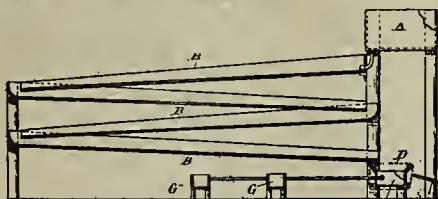
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PULP DISTRIBUTER AND FEEDER.—No. 725,932; L. Cohen and J. Gross, Sombereete, Mexico.



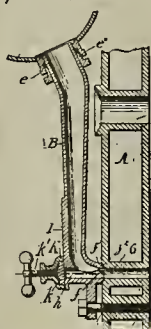
Distributing feed device for ore pulp containing rotatable rolls consisting of cylindrical hollow body having closed end portions, and perforated or foraminated curved bounding surface, in combination with trapezoidal feed table and rotatable rolls located at longer of parallel sides thereof.

METHOD OF EXTRACTING GOLD FROM ORES.—No. 726,294; F. J. Hoyt, Chicago, Ill.



Method of milling gold ore consisting of pulverizing ore; distributing ore thinly over wide, long open sluice-way; flowing ore and propelling it forward over its bed by action of stream chemical solution adapted to dissolve ore; automatically screening and separating solution from tailings by same force; subjecting solution to reagent precipitate gold therein.

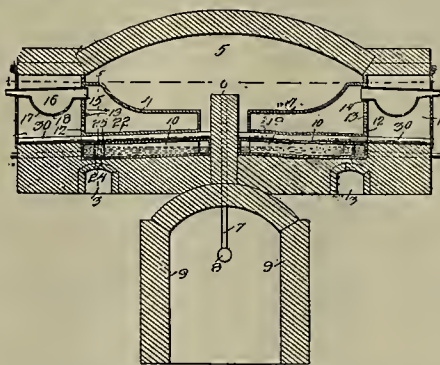
TUYERE FOR BLAST FURNACES.—No. 726,422; O. S. Garretson, Buffalo, N. Y.



Combination with furnace and tuyere, of blast pipe arranged above tuyere provided at outlet with stuffing box, and tuyere pipe having upper end arranged in stuffing box capable of being raised and lowered

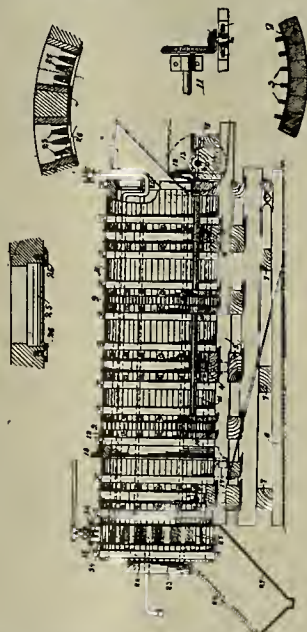
in same and having lower end turned inwardly and detachably connected with tuyere.

APPARATUS FOR REFINING ZINC SPelter.—No. 726,432; T. Jones, Iola, Kans.



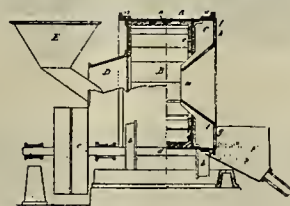
Combination with muffle, of water bosh disposed beneath same and provided in top with channel, and boxing housing forward end of muffle and having bottom provided with channel registering with water bosh and operating to conduct molten metal without furnace in case breakage of muffle.

CEMENT AND GRAVEL SEPARATOR.—No. 726,498; J. Behm, San Francisco, Cal.



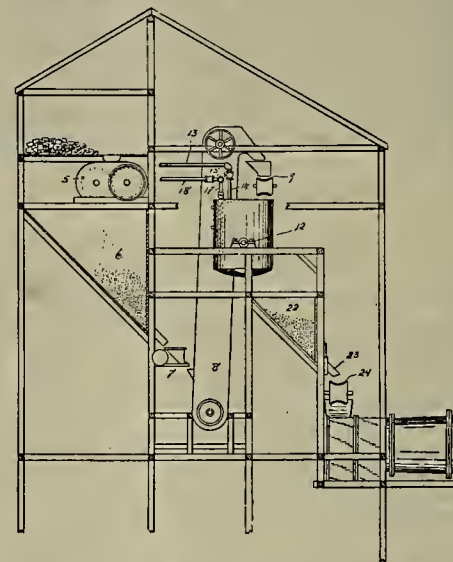
Apparatus consisting of cylinder and adjustable supporting framework; annular tracks fixed around exterior of cylinder, and bearing rollers on frame engaging tracks; annular gears formed of sections bolted to cylinder; shaft extending along outside of cylinder provided with pinions to engage gears; power transmitting shaft extending transversely across head end of cylinder and intermeshing gears between two shafts; means maintaining transmitting gear in mesh with gear first named shaft consisting of boxes in which power shaft is journaled, boxes having slots transverse to axis, and bolts passing through slots whereby boxes and power shaft may be moved to maintain gears in mesh when inclination of cylinder is changed.

APPARATUS FOR CRUSHING OR CRUSHING AND SORTING ORES, ETC.—No. 726,521; E. Ferraris, Montepioni, Italy.



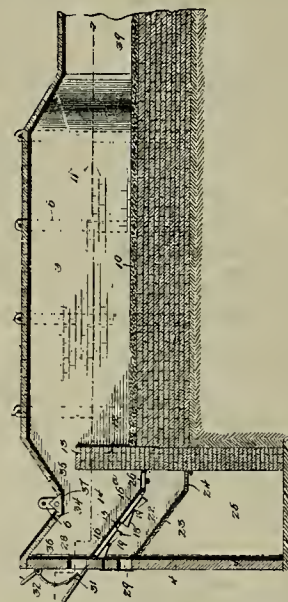
Ore crushing apparatus consisting of grinding cylinder divided into two compartments by partition parallel with heads of cylinder, partition being provided with opening for return of oversize ore and with openings intermediate between opening and outer edge of partition, means for crushing ore in one of compartments, means for sifting ore which has passed into other compartment and discharging sifted ore therefrom, and return cone situated in last mentioned compartment and adapted to return oversize ore through opening provided therefor in partition into crushing compartment for further crushing.

ORE TREATING PROCESS.—No. 726,802; B. T. Nichols, Montevista, Colo.



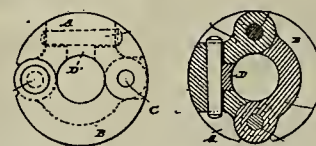
Mixing suitably pulverized ore with lime; applying water to mixture and introducing steam whereby pulp is agitated and kept at suitable temperature until certain impurities which retard leaching are freed; washing pulp by introduction of water and continued agitation, draining off water as far as practicable, drying ore.

METAL TREATING FURNACE.—No. 726,728; M. J. Murdoch, Youngstown, Ohio.



In metal treating furnace, combination with hearth chamber and fire chamber separated by bridge wall, of roof having horizontal section over hearth chamber, and depressed portion or drop constituting crown of fire chamber, depressed portion or drop including inclined updraft section lying above bridge wall and meeting horizontal roof section, also including separate inclined section reaching front wall of casing form therewith, closed gas pocket in front upper corner of fire chamber.

TAPPET FOR USE IN STAMP BATTERIES OR THE LIKE.—No. 726,624; M. Bodley, Johannesburg, Transvaal, South Africa.



Tappet comprising two members hinged at one side and adapted to embrace shaft, edges of members on opposite side having overlapping portions provided with aligning openings, fastening rod passing through opening in side of one of members for keying tappet to shaft.

PROCESS FOR EXTRACTING GOLD.—No. 725,895; M. V. Uslar and G. Erlwein, Berlin, Germany.

Process for extracting gold from auriferous ores, lixiviating ores with solution of potassium cyanide, hyposulphites and sodium chloride.

Ore Treatment at Mt. Lyell.*

The company has eleven blast furnaces, arranged in two smelting plants, the older or No. 1 plant containing six blast furnaces, and the newer plant, No. 2, five. The latter furnaces were built according to experience gained in the operation of the former, and were made considerably larger, the respective sizes in the plane of tuyeres being as follows: No. 1 plant, 40 inches by 168 inches (except No. 3, which is 36 inches by 126 inches); No. 2 plant, 42 inches by 210 inches; the height in each case, from the tapping to charge floor, is 20 feet over all; the height of ore column above tuyeres is 9½ feet; the number of tuyeres (3 inches throughout) is thirty-two in No. 1 plant (twenty-four in No. 3 furnace), and forty in No. 2 plant. The furnaces are water-jacketed high up, the jackets all being cast-iron, with the exception of the small steel plate tympan jacket. At the present time it may be said that three of the large furnaces of No. 2 plant practically smelt into first matte all the ore that is delivered, while two furnaces of No. 1 plant are devoted to the concentration of the first matte into converter matte, and only occasionally treat ore alone. Under these circumstances, each furnace of No. 2 plant sometimes smelts up to 350 tons of Mt. Lyell pyrites per diem, and the average, as calculated from the four weekly returns, is about 270 tons of pyrites daily. Phenomenal tonnages are occasionally reached; thus, No. 6 furnace recently treated a total of 724 tons of material (matte, silica, limestone and slag) in a single day. This vigorous work is due to the fact that the amount of air formerly distributed to the large number of furnaces is now supplied to the smaller number. Simultaneously the blast pressure also has risen, until it is now on a level with the pressure made use of in the progressive matte-smelting establishments of the United States and British Columbia, and ranges from thirty-six to forty ounces at the blowers, and from thirty to thirty-four ounces at the furnaces, the difference at the two points being loss by friction in hot blast stoves, blast mains and furnace connections. To meet this higher pressure no alteration was made to the furnaces, except the raising of the sump, i. e., the elevating of the overflow level of the furnaces by several inches for the proper tapping of the blast, the same as before.

At the same time, important improvements were also made in the motive power department by the installation in each smelting plant of steam saving appliances, consisting of Green's economizers, with induced draught fans and a system of steam superheaters. The economy effected by the economizers is determined as 15%, and by the superheaters as 16%, total saving 31%. The waste heat of the fireboxes of the hot blast stoves, in addition to that of the boilers, contributes to this high result. The steam plant of the Smelting Works is, therefore, entirely up to date, and the various improvements have succeeded in lowering the cost of power to what must be regarded as the local minimum. The fuel employed is still chiefly firewood, the use of coal being merely auxiliary. The respective consumptions under the boilers were, for the year, 36,443 tons of wood and 1794 tons of coal.

The work done in this department for the year was the highest yet performed. There are six 124 H. P. boilers available in each smelting plant, two in each case now being in reserve. The average indicated horse power was 1905; total engine revolutions, 310,000,000; air delivered to furnaces, 31,000,000 cubic feet, weighing 1,054,000 tons. The air was heated to an average temperature of 580° Fahr., thus absorbing 291,500,000,000 British thermal units out of the combustion of 49,000 tons of firewood in the hot blast stoves. The latter have continued to give every satisfaction. In point of repairs the eight stoves (four in No. 1 plant, with fifty-six cast-iron U tubes each, at 16 cwt., and four in No. 2, with seventy U tubes each) have given practically no trouble, there having been only about a dozen tubes completely replaced since the beginning, on account of burning out. The number of hands employed in the smelter motive power departments is eighty, comprising engine drivers, firemen, cleaners, wood handlers, etc. It may be mentioned that, for the production of the blast, there are in use nine vertical compound condensing engines, 12 inches and 22 inches by 18 inches, set up in marine style, and direct coupled, by means of a flexible coupling, to a No. 8 Root's blower, each of 116 cubic feet displacement; also one reserve No. 7 Root's blower with vertical engine attached, ordinary style, and two reserve No. 7 Root's blowers, belt driven from a horizontal tandem compound engine, 12 inches and 20 inches by 30 inches. The power plant thus follows the unit system, i. e., each furnace has a blower driven by an individual engine, although the blast is not conducted to each furnace separately, but directed into a common blast main. The condensers are of the surface type (1000 square feet), also with vertical compound engines, 6 inches and 12 inches by 6 inches, and air pumps to suit—the latest with Edwardes' pump.

The following are the statistical figures of ore treated, rendered by the company for each quarter of the past year:

Treated.	Quarter ending Sept. 30, 1901.	Quarter ending Dec. 31, 1901.	Quarter ending March 31, 1902.	Quarter ending June 30, 1902.	Total for year 1901-2.
Mt. Lyell ore.....	Tons 69,289	Tons 65,688	Tons 71,111	Tons 79,969	Tons 286,057
Purchase ores.....	21,257	20,731	11,680	4,841	58,509
Metal bearing fluxes..	5,726	6,480	7,702	8,139	28,047
Total.....	96,272	92,899	90,493	92,949	372,613

It is thus apparent that the average per day was the treatment of over 1000 tons of raw mineral-bearing substances, besides which the company has treated in its blast furnaces all the first matte, converter slags and linings, flue dust and all similar middle products formed in the process.

It may be remarked that the grade of the first matte at present does not exceed 15% copper, being a concentration of from six to seven, and more, from the original ore into first matte, all of which work is practically performed, as remarked, by the furnaces of No. 2 plant. The re-treatment of this first matte, or concentration of same, by the furnaces of No. 1 plant, raises its grade to 45% and 50% copper, which is the standard required for proper economical hessmerizing into blister copper.

The output of the furnaces in copper, silver and gold, for the year under review, is as follows:

Output.	Quarter ending Sept. 30, 1901.	Quarter ending Dec. 31, 1901.	Quarter ending March 31, 1902.	Quarter ending June 30, 1902.	Total for year 1901-2.
Fine copper in blister (tons)....	2,630	2,579	2,520	1,870	9,608
Silver, fine (ozs.)....	164,932	160,102	182,487	171,133	678,654
Gold, fine (ozs.)....	5,224	5,002	5,650	5,555	21,451

The total money value of this year's output, calculated upon the changing quotations for the copper and silver, is given as £765,584.

The grand total of ore treated since the beginning of smelting operations on June 25, 1896, up to March 31, 1902, as given in the company's last report, together with average assays, is as follows:

Treated.	Total tons.....	Average Assay.		
		Copper, per cent.....	Silver, ozs....	Gold, ozs....
Mt. Lyell mine.....	1,160,684	3.00	2.81	0.101
Purchase ores.....	154,923			
Total ores.....	1,315,607			
Total metal-bearing fluxes.....	33,023	1.64	0.21	0.020
Grand total ores and metal-bearing fluxes.....	1,348,630			

The principal consignor of outside purchase ores was the North Mt. Lyell Co., which has supplied half the total. Then, in order, follow the Lyell Tharsis, Mt. Lyell Blocks, and the old South Tharsis Co., while small lots have been received from the King Lyell, Duke Lyell and Prince Lyell companies. The North Mt. Lyell Co. completed its contract shortly after the end of the year. It is interesting to state that the average assay of all the purchase ores, representing, as it does (with the exception of a quantity of rich ore shipped to England by the North Mt. Lyell Co.), an approximation to the average value of the siliceous hornite ores of the district is: Copper, 6.70%; silver, 1.93 ounce; gold, 0.002 ounce. The Mt. Lyell pyrites, therefore, though lower in copper, are relatively higher in silver and gold than the average hornite ore of the district. The aggregate average assay of all ores treated by the company in the course of time is: Copper, 3.44%; silver, 2.70 ounce; and gold, 0.090 ounce.

The following last half-yearly average analyses may be of interest:

	Silica, Per Cent.	Iron, Per Cent.	Alumina, Per Cent.
North Mt. Lyell.....	63.70	6.22	10.10
Lyell Tharsis.....	64.00	5.08	17.25
Mt. Lyell Blocks.....	60.91	7.91	10.60

If the returns for the quarter from the end of the company's half year to that of the statistical year are added to the above, the results are as follows:

	Tons.
Mt. Lyell ores treated.....	1,240,653
Purchase ores.....	159,764
Metal-bearing fluxes.....	41,162
Grand total.....	1,441,579

tons of local ores furnished by the company from the beginning to June 30, 1902.

Besides the above-mentioned, there have also been smelted the following quantities of other materials from commencement up to the end of the company's last half year (March 31 last):

	Tons.
First matte.....	271,913
Silica flux.....	327,183
Limestone flux.....	182,202
Flux slag.....	281,134
Coke used at blast furnaces.....	81,044
Flue dust re-treated.....	24,022
Converter slags.....	45,223
Converter linings.....	7,276

Add ores and metal-bearing fluxes..... 1,219,997
Total materials furnished..... 1,348,631

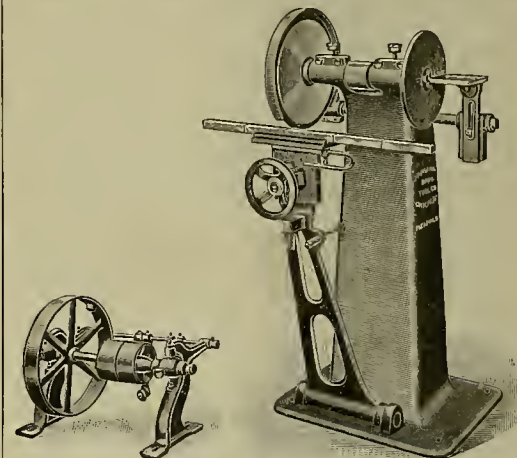
Total materials furnished..... 2,568,628

The above figures apply to the twofold smelting, but do not include the hessmerizing of the product—i. e., converter matte.

(TO BE CONTINUED)

The Armstrong Cutting-Off Machine.

The Armstrong Bros. Tool Co. say that in the manufacture of their tool holders it is necessary to cut off large quantities of self-hardening steel into cutter lengths. Experience has taught that this class of steel gives best satisfaction when cut off cold. The ordinary shop practice has been to cut the steel off hot or to break it off on the anvil. The objection to the latter method is that the break is liable to be very irregular, resulting not only in a serious loss of steel, but also in vastly increased grinding, with attendant waste of time and emery wheels. After experimenting with various methods of doing this work, they have developed the machine herewith illustrated, which in a slightly different form has been



Cutting-Off Machine.

in use in their works for about two years, and which they claim has given perfect satisfaction, and with practically no expense for maintenance. The cutting is done by a disc of special grade tool steel revolving at high speed. Any attempt to cut soft steel or ordinary cast steel with a disc results in a rough dragging cut with flaring lips, which hind the disc to such an extent as to reduce its speed to a point where it is ineffective, if it does not actually bend or break the disc. Owing to the peculiar nature of self-hardening steel, however, it is not affected in this manner by the cutting disc, which makes it, even when forced hard, a clean, clear-cut incision. The periphery of the disc is coated with self-hardening steel particles, and these particles do the actual cutting.

Having had numerous inquiries from machine shops regarding this method of cutting off self-hardening steel, they have decided to place the machine on the market.

Its convenience and economy, they say, will make it a paying investment for any machine shop. The machine is of combination form, the steel-cutting disc being mounted on one end of the spindle, while the other end of the spindle carries a 12-inch grinding disc. The speed at which the machine is intended to run is such as to give the best results for both operations. The construction of the machine is first class. The spindle is of tool steel ground true. Bearings are cast iron and are dust proof, with convenient and positive adjustment for wear and to take up lost motion. The swinging table is provided with a length gauge and is conveniently adjustable for steel of different sizes or depth of cut. The cutting disc is provided with a neat guard, which can easily be swung back out of the way when changing disc.

The grinding disc is made of boiler plate and is provided with an adjustable table, so located that the operator will not interfere with cutting off long bars of steel. Each machine is equipped with counter shaft, one cutting disc, one grinding disc, one breaking hock, one press for emery discs, one dozen emery cloth discs assorted, one pound lubricating grease and one can special cement for attaching emery cloth to grinding disc.

*From the report of the Secretary of Mines, Tasmania.

Oil and Dust From Rock Drill Use in Mines.

It is an encouraging sign of the times that the question of the health of the miners should receive such serious consideration as is recently being given it in connection with work in mines. In South Africa a commission has been appointed and it is alleged that laws are to be passed specifying certain regulations by which the lives of the miners will be prolonged, says the Compressed Air Magazine. Opinions differ as to what causes the trouble, but no one doubts the fact that the lives of miners have been shortened by some of the conditions that exist in mines, and particularly in the African mines. It is well known that ventilation is an important auxiliary to men working in mines. Bad ventilation in mines is just as hurtful as had ventilation anywhere else, and unless the miners have good air to breathe they are liable to be affected by disease, especially so as the damp atmosphere in the mine and the changing degrees of temperature cannot be considered as favorable conditions. Some think that oil either from the air compressor or from the rock drill is responsible for the miners' diseases, and cases have been cited where asphyxiation and even death have resulted from the discharge of "bad air" into the mine through the pipe leading from the engine room. We have a record of perhaps the most serious case of this kind, one which occurred several years ago in a Western mining field and which resulted in the death of more than a dozen men, the direct cause being a fire in the engine room, and as the air compressor throttle had not been closed the machine continued to work while the building was burning all around it, hence the products of combustion were sucked into the compressor and forced into the mine, the miners being ignorant of the existence of a fire on the surface and having no means by which to discover the trouble until it was too late to prevent serious consequences. Here is an accident which cannot be compared with normal conditions, and yet it has a bearing on the case, because it points to unforeseen possibilities and also to the importance of discharging only pure air through the line pipe into the mine. Pure air is not always compressed by air compressors. This is due sometimes to defects in design and at other times to negligence. A properly designed air compressor when used to pump air into a mine should have compound air cylinders, with intercoolers and aftercoolers. To compress air up to pressures from 75 to 100 pounds in one stage—by a single blow, as it were—is to heat it beyond reasonable temperatures and to turn the air to such an extent as to produce unhealthy conditions. Stage compression means a gradual piling up of pressure with a gradual increase of temperature and no smell from burnt oil or other particles which are often taken in with the air and heated to excessive temperatures during compression. By stage compression not only are lower maximum temperatures produced, but the air is brought down to atmospheric temperatures when passing through the intercoolers and aftercoolers, and in this way less power is consumed in compressing the same volume of air to the same pressure, and such things as oil, smoke, water and dust are collected by the cooling devices and blown off just as sediment may be blown off from a boiler.

It is said that oil when discharged from the exhaust of rock drills is hurtful to the miners and that it interferes with the amalgamation process. As to its being hurtful to the miners, we can scarcely agree as to the possibility of this, as when the oil is discharged from the exhaust it is at such low temperatures as to be condensed into a liquid which drops to the floor or is blown against the walls of the mine. In other words, it is not in the condition of a vapor or gas. As to its interfering with the amalgamation process, the late Mr. Collins of the Smuggler-Union mine at Telluride, Colo., who was an acknowledged expert in all that pertains to mines, made some exhaustive experiments to determine the effect of oil upon the amalgamation plates, the results being uniform in each case and showing no effect whatever. Oil floats on the surface of water, while the particles of gold sink to the bottom. Oil being lighter than water, it is not at all likely that it will carry particles of gold with it. But whether oil, when used in rock drills, is hurtful or not, it is plain that too much oil is used and too little attention is given to the wastefulness of oil. When a rock drill becomes worn its efficiency is much improved by frequent doses of oil. This is especially true of rock drills that have independent valves—that is, valves that are not moved by direct mechanical connection with the piston. The oil fills up loose spaces and with the aid of lubrication the machine works more like a new one. Of course, the proper plan to pursue when a rock drill is worn is to take it out of the mine and repair it, because a loose piston and a loose valve waste air, and in most mines they are wasteful also in oil. However this may be, a runner usually keeps the machine at work until it breaks down or will not work any longer, so that it becomes important to recognize this situation and endeavor to save in some other direction. It is had enough to waste air, but when so much oil is thrown away this wastefulness becomes important and even

serious. A little soap and water will save money and accomplish the same results when fed into a worn rock drill, and nobody will claim that soap and water interferes in any way with either the health of the men or with the amalgamation process. It is cheaper than oil, it is a fair lubricant, and in the cold passages of the rock drill it becomes thickened and serves an excellent purpose in filling up loose spaces. It cannot injure the machine, provided it is not allowed to remain in the machine when it is idle, as in such a case as this it might produce rust. Just before shutting down the rock drill oil should be run through, and in this way the soap and water will be neutralized by the oil and the machine made free of rust.

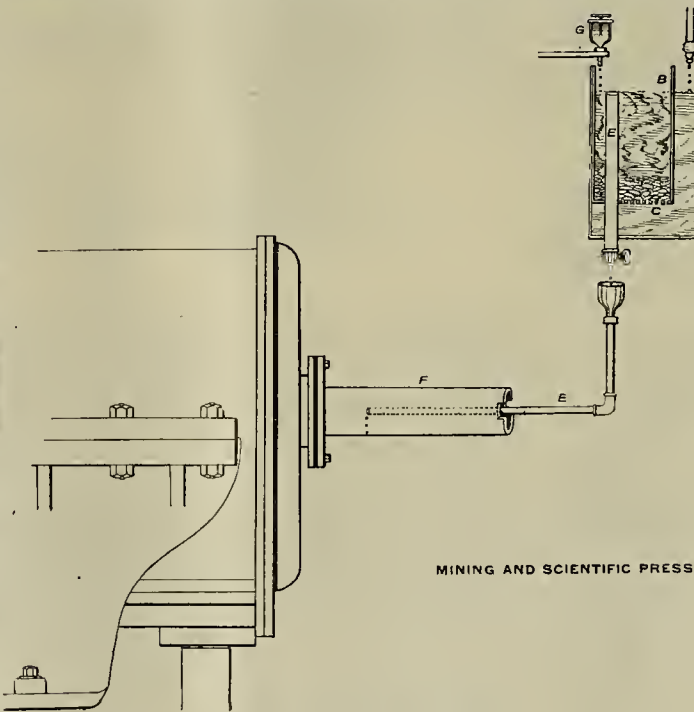
The real cause of the so-called miner's consumption is, in our judgment, due to the fine particles of dust that permeate the atmosphere and become impregnated in the lungs of the miners. This dust is excessive only in dry hole work or in raises where it is difficult to introduce water into the hole in the process of drilling, but it is quite possible to prevent this entirely by the injection of water through the drill steel, or by forcing it through a tube which is placed alongside of the steel, and which is connected to a common bicycle foot pump. The trouble is that too little attention is given to matters of this kind, because dry hole work in mines is not general and the miners do not care to change to any special appliances when engaged in this work. It is quite likely, however, that agitation of the subject will result in the introduction of practical appliances by the use of which excessive dust in the mine may be absolutely prevented.

Lubricator for Feeding Soap Suds to Compressors.

In compressing air to 90 and 100 pounds gauge pressure with a single stage air compressor, the temperature of the air after compression frequently reaches 450° to 500° F. This high temperature results in more or less carbon being deposited on the discharge valves and passages, and trouble is often experienced in properly lubricating the air cylinder.

Especially is this the case where compressors are run at high speed and the temperature of intake air exceeds 80°, or where an inferior grade of oil is used. To overcome this trouble soap suds has frequently been used as a lubricant instead of oil with good results.

The illustration shown herewith shows a novel way



Feeding Soap Suds Into Cylinder.

of feeding soap suds into a cylinder provided with piston inlet valve, and will, no doubt, be of interest to engineers who are using machines of this kind, who have experienced the trouble referred to above. The device consists of a small galvanized iron water tank (A) about 7 inches long, 6 inches wide and 12 inches deep. Inside of this tank is a smaller one (B), which is soldered to the large tank, and the bottom of which is about 2 inches above the bottom of large tank. In the bottom of small tank are a number of holes $\frac{1}{8}$ inch in diameter, shown at (C). Soft brown soap (cut up in small pieces) is put into tank (B). Water is then fed into large tank through a $\frac{1}{4}$ -inch pipe (D) and passes through small holes at (C), dissolves some of the soap and raises to top of $\frac{1}{8}$ -inch pipe (E), through which it passes down into inlet of compressor. The water is regulated at (D), the small cock under tank being left wide open. Just before shutting down compressor the water is turned off at (D) and oil is fed into the small tank (B) from cup (G). The compressor is then run with oil for half an hour in order to prevent rust. It is import-

ant to use soap that will sink in water, otherwise small chips of soap will float to top of tank (B) and pass down through pipe (E).

This device is used on an Ingersoll-Sergeant compressor having a steam cylinder 14 inches diameter by 18 inches stroke, and when running at 120 revolutions per minute with air pressure at ninety pounds, the water is fed through (D) at about forty-five drops per minute. Soap suds has been used in this cylinder for the past four years and no trouble whatever has been experienced in properly lubricating it. The engineer reports the walls of cylinder in perfect condition.

The arrangement shown has been used with much success at the power plant of the Terminal Railroad Association in St. Louis, Mo., and was made by the chief engineer at that plant, E. A. Kolbe.

Were the Nome Gold Fields Previously Worked by Russians?

Written for the MINING AND SCIENTIFIC PRESS by OTTO HALLA.

It is evident from discoveries made in the Nome gold fields that at least part of the fields were known prior to the advent of the American miner. Evidences exist that clearly establish that the diggings were worked intelligently, though it may have been a century ago, or more, when gold was mined from the creek in what is now known as the Cape Nome district.

The present generation of Esquimaux, living at Port Clarence harbor and Norton sound, did not have traditions of any gold discoveries. It is probable that, had the Esquimaux known of the existence of gold and its value, the discoveries would have been made prior to the last few years, in view of the fact that the Port Clarence harbor was a rendezvous for many years back of whalers, more so in 1850 to 1870 than now, and a fleet of ships frequently wintered for seven months in that locality, and it can be plainly seen that a discovery known to the natives would have been communicated to the seamen, if through no other channels, than through the Esquimaux maidens. Last summer parties working a claim on Gold Run, one of the richest in auriferous gravels, were opening the property preparatory to constructing a hedrock dam for sluicing. The claim has been well prospected, and it was noticeable that in the locality where the hedrock dam was to be placed the pay has given out.

Upon further investigation, and at a depth of 7 feet from the surface, the workmen came upon a regularly constructed stone wall, which went down to bedrock of the creek 8 feet deeper. This work was done in such a manner as to leave no doubt that the work was done by white men with a good knowledge of engineering and was the work of several weeks, if not of months.

The discovery of Gold Run attracted considerable attention in 1900, and based upon the discovery the famous town of Teller on Port Clarence harbor sprang into existence, a town of more than 700 houses, and which at one time threatened to outgrow the northern metropolis, Nome. It was even reported in the fall of 1900, after the Anvil Creek case had been taken out of the Nome courts, that Judge Noyes would transfer his headquarters to the new town. Strange as it may seem, only three or four claims have sustained the reputation first gained for the creek, the balance of the creek proving a disappointment. Not that it did not pay to work—far from it; there is pay throughout the entire creek, but it is not like Anvil Creek. Naturally, upon this discovery the court gave up the idea of moving; the city authorities of the new boom town, after a brief few weeks of power, dropped back to Nome one after another, until towards the fall of 1901 Teller claimed not more than fifty people. This year it will be one of the modern ruins, as the wind and blizzards hold high carnival for six months on Port Clarence harbor.

It would indicate that the lower part of the creek was previously worked, and there could not have been any one else operating other than men with abundant means, as the expense for the necessary provision to sustain life during the time of work must have been considerable. Another discovery was made on Hungry creek that tends to show a previous knowledge of gold in that creek, a rocker of ancient make buried about 6 feet deep from the surface and a silver coin, such as are worn as a charm, and bearing the date of 1700, were found.

It is considered likely that Russian exiles were driven across the Siberian continent to Alaska, and compelled to work for their masters. It is problematical if the higher Russian authorities ever knew

of the wealth of Alaska, but there is no doubt the Russian explorers of Alaska knew more than they cared to divulge. There are evidences of their explorations on every prominent hill of the Seward peninsula, each having a stone monument with a flat center piece, indicating the direction of east and west. It may have been to the interest of the Russians to keep their secret and benefit by it themselves, but as the "unexpected always happens," they may not have reckoned with the idea that the Czar might sell that country, and seeing all communications broken, the land of gold lived only in their memories, and in time the secret was buried with them, until new people discovered the gold anew and new enterprises sprang into existence, and wrested from the frozen soil its treasure.

The Georgia Gold Belt.

Written for the MINING AND SCIENTIFIC PRESS by F. M. SCOFIELD.

Present interest and developments in this field give good promise of opening up much valuable mineral territory. Since its discovery, the State of Georgia has produced over \$20,000,000 in gold alone, and nearly all of it has been taken from above water level. It is surprising that the country has never been thoroughly tested by experienced mining men, with capital, willing to venture upon such splendid surface indications as this State shows to the experienced prospector.

One thing that has held back development in this section, probably more than anything else, is the fact that the prospector has no show here whatever, all lands being in the hands of private owners, with whom proper arrangements must be made before any prospecting can be done. It can be readily seen that as all gold countries are opened up by the poor prospector, this country gives him no encouragement, inasmuch as he first must purchase any territory which may look attractive to him for prospecting purposes.

Notwithstanding this very serious drawback, the mining interests have, within the past year or two, been coming rapidly to the front, and with it the deeper developments which we have all waited for anxiously, knowing that this only would make or condemn our standing as a profitable mining country. Inasmuch as all of our earlier development work was undertaken by men with little or no practical experience, and controlled by the very mistaken idea that mining was such a simple business as to require no more than a general knowledge of its many intricacies, the mistakes that were necessarily made put the mining district in a much worse light to the investing public than if there had been nothing done at all.

The fact that we have survived so many disastrous experiments speaks well for the stability of our future. Capital has persevered and experience has at last taught it to secure men of known ability at whatever cost, and the result is that many propositions are showing up so well as to make their owners feel thankful of having been so persevering under adverse circumstances.

The Crichton mine, the oldest in Georgia, has recently been shut down the first time in nearly twenty years, and that for the purpose of closing out the property for the various heirs of Aaron French, who recently died. In the investigations for the executor, the experts report a large body of ore on the levels from 600 to 900 feet depth, and average ore values of \$6 per ton, in addition to which they have recently opened up a pay streak of \$25 ore. Their very large acreage (about 1000 acres) will make this mine prominent among the producers of low-grade ore.

In White county an Atlanta company have been for many months opening up a pyrite mine, and two reports recently made by different experts, one of them for the Southern R. R. Co. to ascertain the advisability of putting in a 20-mile spur, both nearly agree in reporting the large amount of ore in sight. The company were only looking for the pyrites for commercial purposes, but have found gold and copper values more than sufficient to pay all costs of mining. They have about 300 acres and have only developed to 200 feet deep.

At Tallapoosa, Ga., the Tallapoosa mine, which has been closed for about five years on account of litigation, is now going again, at about 200 feet deep. The present superintendent reports that they have the vein well opened, with values running about \$11 per ton, with 10 feet in width. They also have a 2-foot pay streak of \$30 ore. They are operating forty stamps and eight tables and expect soon to add twenty more stamps. This was a good dividend payer when worked before.

A good strike was recently made in Gwinett county of high-grade ore, running \$150 to \$300 per ton, and many good prospects in this county indicate this to be possibly among the most promising of the whole gold belt for high-grade returns.

Hall county has many promising prospects, upon some of which have been done a good deal of development, the owners of which are enthusiastic for their future.

THE speed of engines with reference to hoisting capacity is figured carefully in all hoisting engines,

and particularly in specially designed plants, and when this running speed is exceeded damage is likely to result to the machinery. Consequently, it is better to allow a large factor, not only for safety in present needs, but for increased capacity or greater depth.

Hydrostatic Level Attained by Ore-Depositing Solutions.*

Written by WALTER P. JENNEY, E. M., Ph.D., Salt Lake City, Utah.

In the limestone area of Tintic and other mining districts of the Great Basin region of Utah, it has been observed that surface outcrops of ore occur but seldom and are mainly confined to points of relatively low elevation, where the veins cross some basin or ravine. Nowhere does a considerable body of ore outcrop on the tops or high up on the slopes of the hills.

Mining operations, on the other hand, have shown that large and continuous ore deposits frequently occur in depth in the limestone, beneath large masses of barren rock. Such ore bodies, when followed upward in the lodes, are found to terminate at well defined levels, without reaching the surface. Yet the ore-bearing fissures themselves extend above the top of the ore, being often traceable, though barren of all valuable minerals, for hundreds of feet above the slopes in the mines, and even observable in outcrops at the surface.

This abrupt cessation of the ore at a uniform horizon does not appear to be connected with any change in the country rock adjacent to the lodes. The strata above and below this horizon seem to be in every way equally favorable to ore deposition. Explorations above it have developed an open-fissured country, barren not only of ore, but also of indications that mineral-bearing gold, silver, lead or copper were ever deposited in the strata at that elevation.

The height reached by the ore, while usually constant throughout the length of a given lode, may vary in particular sections from the operation of local causes. Each lode in a district has its own distinct horizon, above which the ore deposits do not extend. Where the ore bodies are continuous for a long distance on the strike and other conditions are uniform, the top or apex of the ore is nearly level or gently undulating; but more commonly its upper surface is broken into a series of peaks and pinnacles, alternating with flat summits and wave-like crests, reaching up from the main ore channel to practically the same relative altitude, and forming the ore crest or mineral crest of the lode.

Examination discloses in these mines many evidences that the terminal edge of the ore nearest to the surface represents, substantially, the height to which the mineral-depositing solutions ascended in the fissures during the period of ore formation; in other words, that the present ore crest is the high-water mark, or ultimate level, reached as the result of the ascensional force of the heated ore-bearing waters.

In some instances lines of extinct mineral vents, nearly over the ore bodies, on the surface, mark the course of the lode. These are small local outcrops of quartz, chalcedony, siderite, ankerite, barite and other gangue minerals, seldom carrying more than traces of the precious metals. It is not improbable that, during the period of ore deposition, these vents were geyser-like pipes or channels extending from the ore deposits, hundreds of feet below, up through the non-mineralized strata to the surface, and constituting points of escape for steam and gases liberated by the chemical reactions incident to the formation of the ore. Surface explorations of some of them indicate that they were channels of up-flow for the waste waters expelled by the pressure of the steam and gases after the deposition of the ores in the deeper strata. Among other evidence supporting this view is the occurrence in thick, banded sheets, lining crevices and open channels in these outcrops, of white, translucent chalcedony, a mineral deposited by hot silica-bearing waters.

To better understand these peculiar phenomena, it is necessary to consider the conditions attendant upon their formation. The earlier volcanic disturbances of the region are regarded as the direct cause of the elevation of the districts and the upturning of the sedimentary rocks, producing the numerous small mountain ranges and solitary island-like upheavals which illustrate the varied types of the Basin Range structure.

These earlier disturbances were followed by a long period of comparative rest, during which a wet climate prevailed and an extensive erosion of the exposed strata occurred, carving the surface of the districts to nearly their present contour. There were the same low mountain ranges, with spurs projecting like promontories into the sands of the desert, their steep slopes deep cut by narrow, rocky ravines, or scooped out in basin-formed gulches.

Later disturbances, deep-seated in the earth's crust, formed the vein fissures and induced the deposition of the ores at a time when the topography of

many of these mining districts varied little from the present surface. The recent erosion, which has taken place since the deposition of the ores, has probably not removed, even on the more exposed slopes, more than 100 to 200 or 300 feet in depth of rock surface. This preservation of the ancient topography has been due, in great part, to the change in climate. In the present extremely dry period surface erosion is reduced to a minimum. So little are the outcrops of the ore bodies eroded, that the conclusion seems inevitable that the present arid climate has prevailed continuously since their formation.

In such districts the outcrop or intersection of the vein fissures with the old surface erosion would be, in profile, an irregularly broken or serrated line, rising from the lowest points, where the fissures crossed some deep ravine or basin, to summits where the fissure belt cut through the tops of the hills or divides. Under these conditions, the mineral solutions, forced upward in the fissures, found outlets of escape at places of relatively low elevation along their course, with a consequent reduction of head or hydrostatic pressure so great that, no matter how open the fissures, or how favorable the ground, no considerable deposits of ore could be formed above a certain level, depending upon the elevation of the outlets and the volume of the discharge through them of the heated waters, with the accompanying steam and gases.

Not only has the hydraulic head been controlled by outlets to the surface, but the escape of the solutions from the fissures into the walls and into the country rock adjacent, especially in mines in limestone, has also acted to some extent in the same way. The slow circulation of the mineral-depositing solutions through large caves or chambers, or through the interspaces in great masses of brecciated rock, from the extent of surface exposed and the free escape of steam and gases, has caused a reduction of both temperature and initial pressure.

During the long period of ore deposition, fluctuations caused by any increase or diminution of pressure or of temperature in the ascending waters would naturally occur in the hydrostatic level. It must have been subject to various accidents, such as the opening of new outlets at lower levels, or the choking or closing, by any cause, of outlets long in action. Moreover, the upflow through the fissure would be modified by crustal movements opening or closing its channels, and thus affecting both its volume and its pressure. Many other factors—for instance, the specific gravity of the solutions and the proportion of steam and gases mingled with them—must have had their effect.

The mixture of a liquid with a gas reduces the weight of a given column; and, when this column is under a hydraulic head not thus affected, this reduction of its weight is equivalent to increase of pressure in augmenting its flow. Friction produces a loss of effective head, which rapidly increases in rapid or tortuous channels, and must become very great where the solutions spread out and traverse the interspaces of fractured or brecciated rocks.

Since the completion of the primary ore deposition, oxidation and reformation of the minerals have tended to move the ore crest downward in the fissures; but the quartz and other gangue minerals remain, together with oxidized ores, in such quantity that there is usually little difficulty in determining the original crest level.

In most mining regions erosion has been so great since the period of mineral deposition closed that many hundreds and often thousands of feet of strata have been removed, destroying all record of what occurred in the upper parts of the veins. So far as observed by the writer, mineral crests such as have been described above occur only in those districts in the Basin region where, at the time the ores were deposited, the surface was deeply cut by erosion, and the later climatic conditions have been such as to preserve the old surface with little alteration—a combination of conditions which must be regarded as exceptional.

Now that attention has been drawn to this subject, it is not improbable that like occurrences will be found in other mining regions of the world; and we may certainly look for the discoveries of similar deep-seated ore crests not formed and determined chiefly, or at all, by the position of surface outlets, but due to the inadequacy of the initial pressure of the heated water to force them to the surface—a condition comparable to that of many artesian basins, where flowing wells do not exist, because the hydrostatic level is underground.

The observations of the writer indicate that ore crests are not confined to veins or lodes of replacement in limestone, but may occur in fissure veins in quartzite, and in lodes traversing eruptive granitic rocks.

A NOVEL SUBSTITUTE for hemp packing has been introduced by Mr. Firey, superintendent of the Silver Lake mines, at Silverton, Colo. In the stuffing boxes, as a packing and bearing, he is using a compound of chilled shot with graphite or paraffine. As it becomes warm, a little more is introduced, and it has never yet, any part of it, to be thrown away, and is said to do excellent work. The shot must be of such size that it will not work out. Where it is necessary to mould the packing paraffine is used, otherwise graphite.

*Trans. Am. Inst. Min. Eng.

Slate Creek Camp, Washington.

Written for the MINING AND SCIENTIFIC PRESS.

Slate Creek camp is situated on the west side of the Cascade mountains, near the summit, at an average elevation of 5000 feet above sea level, in the northeast corner of Whatcom county, about 12 miles south of the 49th parallel. It is accessible from both the east and west. At present there are about 40 miles of trail to be traveled coming from the west, but the Bellingham Bay Railroad is building towards it, and within a year or two transportation will be more convenient. At present most of the travel comes from the east, leaving the Great Northern Railroad where it crosses the Columbia river, then up the river by steamer 80 miles, then 60 miles of wagon road to foot of the main range, the last 10 miles to the camp being over a narrow gauge wagon road, which the miners have built to transport machinery. This road is 4 feet wide, and was laid out by an engineer on a gradient of 6% to 9%. Over this road, or trail, there has been hauled four quartz mills into the camp, besides many tons of mining machinery. Specially constructed wagons are used. These are about 26 inches high and 28 inches wide. Two horses, working tandem, will take a ton over the trail in a day. The accompanying illustration



Mortar at Foot of Slate Creek Trail, Washington.

shows a 6000-pound mortar being moved to the Mammoth mill. The wagon used was made of heavy timbers, the wheels being sawed from logs, and the mortar swung close to the ground, between the wheels.

The formation of the country rock is mostly quartzite, with strata of black slate, cutting through, and it is noted that where a lode cuts through the slate the ore is generally larger and richer. The lodes as a rule cut through the ridges nearly east-west with a dip of 50° to the north. The side hills are steep, and in nearly every instance development work is commenced on the lode and consists of drifting, and will give about 1 foot of back for each 1½ foot driven thus for the time being, doing away with hoisting and pumping of water, of which latter there is a large amount. Some of the more noted claims in camp are the Eureka, Mammoth, Chancellor, Mountain Goat and Mill Creek, each consisting of a group of claims, of which, perhaps, the Mammoth can be taken as representative.

The lode crops at the creek and at intervals up the side hill to the top of the ridge, a difference of elevation of some 900 feet. The main workings consist of a drift started on the lode about half way up the hill and driven in 1000 feet on the lode.

The ore lies in shoots, dipping about 40° to the east, and in width varies from 1 foot to 9 feet. The average value of the ore so far cut is \$20 in gold per ton, of which 60% to 70% is free, the balance of values being in sulphides, of which there are about 4%. There is little barren quartz. The present face is 700 feet below the surface and the percentage of free gold remains the same as near the surface. There is often found fine specimens of free gold and tellurides in different forms. Generally there is associated with them considerable lead and zinc. The ore is always rich, assaying \$10,000 to \$100,000 per ton. So far the rich spots have been found

where the lode cut the slate formation, and the most was found in the first main shoot encountered in driving the drift, which was 90 feet below the surface. The company are sinking a shaft with the view of sinking to 500 feet on the ore. Chunks of nearly pure lead are found at times, and these always assay high in gold, seldom under \$60 and often \$1000, while the silver contents is small, not over 10 ounces per ton, the mine generally carrying one-half ounce silver per ton. The Mammoth company first put in a small steam mill made in sections and packed in on horses, the building being entirely of logs. This mill, while proving to be a very shaky affair, owing to poor foundry work, was run until \$30,000 had been taken out, which proved the free milling character of the ore. The company has now installed a modern mill of 1000-pound stamps, with 24 feet of copper-silvered plates to each five stamps. There are four concentrators. They are also erecting a small chlorination works to treat concentrates. The mill is located 4000 feet from the mine and the ore will be sent down by aerial tram. The power for the mill will be water under a 400-foot head, which will also serve to drive an 8-drill compressor, which will furnish air for machine drills and pumps.

The Eureka is about 1 mile from the Mammoth and was equipped with a 10-stamp mill with sectional mortars, and operated by steam. The sectional mortars not proving satisfactory, and wood in the vicinity becoming scarce, they are arranging to install electric power to generate, for which there is abundant water power near. This property turned out a large amount of gold while running, the main ore body being 28 feet wide in slate formation. They also found very rich tellurium ore.

The Mountain Goat has completed a small cyanide mill, the gold in their ore being finely disseminated through the quartz. The Mill Creek has a group of claims 6 miles from those mentioned, and while none of the quartz shows free gold to the eye yet it pans rich. The character of the quartz is about the same as that in the rest of the mines in the camp, with the exception of containing more copper pyrites in some of the shoots. Where the copper is encountered the ore is always rich in gold, assaying \$50 to \$250 per ton. The lodes are well defined and have been traced by crosscuts on the surface for over 1 mile. Across the ridge from the Eureka and Mammoth a change in the ore seems to take place, more silver showing, while gold values are good. In the Chancellor mine native silver can be seen in nearly all the ore, while specimens are plastered with the metal.

Timber around the summit is scrubby and scarce, which makes steam expensive, but from 1 to 2 miles down on either side it becomes plentiful. There is an abundance of water, however, within a mile or two of any claim, so it is a question of transporting ore to water or generating electricity and conveying it to the mines. The average snowfall is 25 to 30 feet, seldom more than 4 feet deep at one time. The weather is mostly mild in winter, the thermometer standing about 20° above zero, with two or three days during the winter of 2° below.

Ventilation in Cornish Mines.

"For some time J. S. Haldane, F. R. S., has been engaged with J. S. Martin, Inspector of Mines, in an inquiry undertaken at the instance of the Home Office as to the ventilation of Cornish mines," says the London Post. "Of these, the largest and most important is Dolcoath, and for some years the men working there have suffered from a disease to which the name 'Dolcoath Anaemia' was given. They paled as to the face and lips, and if they exerted themselves they suffered from palpitation. They were liable to become dizzy and faint and were suspected of having heart disease. Almost the whole of the patients from Dolcoath had an itching of the skin, with pustular eruptions which they called 'hunches.' Neglected cases became gravely complicated, and there was a danger of heart failure. Death might occur, the immediate cause being some intercurrent disease, such as pneumonia or phthisis. Dropsy might also supervene."

"Most of the cases occurred in one particular shaft; indeed, everybody who worked there was affected in greater or less degree. Generally they were soon incapacitated from work underground, and it was found that they had improved rapidly when they had been employed for a little while at the surface, where daily re-infection was impossible. In some instances this beneficial change was effected simply by shifting them to another shaft."

"On investigation, Dr. Haldane came to the conclusion that the men were suffering from ankylostomiasis. This is a disease which is caused by a worm that

lives and multiplies in the upper part of the small intestine. The worm is about half an inch in length, and has a 'suctorial' mouth with four teeth. In 1854 it was recognized as being the cause of a disease then common in Egypt and known as 'Egyptian chlorosis.' Soon afterwards it was found to be common in Brazil, and since then it has been recognized as a frequent and a troublesome cause of disease in tropical and sub-tropical countries all over the world. The disease has occurred on the Continent—it broke out among the workmen engaged in making the St. Gothard tunnel—but in England it has only been observed by Dr. Manson among Lascars at the docks.

"Some three or four years ago it had occurred to the manager of Dolcoath that the disease might have some connection with a certain lack of cleanliness underground. He improved the ventilation, and he had large quantities of chloride of lime and permanganate of potash used in the infected parts of the mine. Dr. Haldane has no doubt that by taking this step he checked the progress of the disease. Cornish miners are constantly going abroad, but they frequently return after a short time, and sooner or later they go back to their old employment. Thus, it is supposed, Dolcoath was infected. The conditions were favorable; among other things the temperature was high. In one of the levels Dr. Haldane found it to be 79°. The disease, once it has been recognized, can be treated without difficulty, except in advanced cases, for the worms are expelled from the system immediately on the administration of thymol. At the time when this report was written, one patient was so ill that it was not thought that he could recover. Dr. Haldane states in an interim report to the Home Office, which has just been published, that steps have been taken to disinfect the dangerous parts of the mine, and to make the conditions such that the worm, even if it should be introduced by some one coming from abroad, will find life impossible. The precautions are all in the direction of securing cleanliness and good ventilation."

Survey in North Carolina.

Owing to the increasing interest in the mineral resources and the preservation of forests in North Carolina, the United States Geological Survey has decided to make a careful resurvey of about 1000 square miles in Burke, Caldwell, McDowell, Rutherford and Cleveland counties in this State. The work has already been begun under the charge of W. C. Hall, assisted by L. S. Leopold, O. E. Camp, C. E. Foster, R. C. Howard, C. Williams and I. K. Munroe.

The preliminary map of this section, made in 1886, shows in a general way the physical features of the country and the main roads. The map based on the new survey will show all roads and streams, all houses, mines and railroads, as well as the physical features of the country. The topography will be shown by contour lines representing altitudes above sea level, accurately drawn at vertical intervals of 100 feet. These lines will enable any one using the map to determine the elevation above sea level of any particular point. The positions of such contours are ascertained by running a great number of spirit-level lines, and the elevations of certain points in the area are shown by numerous bench marks (iron or stone posts set up) which have the altitude above sea level stamped upon them.

Immediately north of this area are the highest mountains in the United States east of the Rockies, and to the west is the far-famed "Land of the Sky"—Asheville and the beautiful French Broad River valley. The area is rich in mineral resources. Gold is found in several places, and also the peculiar earth from which is obtained monazite, used in the manufacture of mantles for incandescent lights like the Welshach burners.

Useful Combination Tongs.

A useful pair of combination tongs which any smith can easily make is illustrated herewith. The designer says: The tool shown I find of use as a pair of tongs, clip tie and holt head holder, both at the fire and at the vise. The jaws have a half round swage crease sunk on the inside of each. About ¼ inch from the outer end of each I sink a transverse or cross crease suitable for receiving the edge of the head of a holt. As it is deeper in the center than on either edge, it holds a short holt firmly in the fire or in the vise when welding, cutting threads, taking off nuts, or running



Combination Tongs.

down nuts on holts. This is done without damage to the heads. The ends of these tong handles are made one hooked, the other flat, straight and fitting inside the hook of the other handle. This forms a clip tie. Such tongs will be found a combination which will save a blacksmith many steps during a day's work looking for the tools which it combines. It will also hold flat and round iron.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence). — Mining operations around Nome are progressing, many dumps being taken out for the spring washing, particularly on Teluk and Otter creeks, and the pay seems to be uniform all along the beach line. Another and richer paystreak has been found farther inland, and near the foothills. What effect the wet winter and the heavy snowfall will have on the opening of the summer season remains to be seen. The past winter's snowfall has been the heaviest in the last four years, being 4 feet on a level. The ground is, however, not frozen to much depth owing to the early snow in the fall which protected the ground. Considerable interest is being shown in the Solomon River country, where rich diggings are reported. The tributaries of Shovel creek are attracting a good many, especially Mystery creek, where six camps have been working all winter. At the Big Hurrah quartz mine, owned by C. D. Lane of San Francisco, Cal., development is progressing, and the shaft is down 110 feet. Ore is being taken out, showing free gold. A number of other quartz mines are being developed.

Nome, March 1.

A stretch of 25 miles of proposed railroad from Valdez to Eagle City, on the Yukon river, will be built before winter, says Manager A. Biles. The company is made up of New York men. They purpose building the road for the development of the copper deposits in the Chitina region. Ultimately they intend to build branches, one from the junction of Chitina and Copper rivers to the Noselna placer district, and another down the Tanana to Fairbanks.

Manager W. S. Gage, for G. Mitchell of Cornwall, England, reports taking a bond on 105 copper claims owned by R. Blei & Co. of New York, in Copper River valley above Valdez, together with other Copper River properties, for \$12,000,000. Blei & Co. own other gold and copper claims in the same district. Gage also bought the Gladhaug mine on Latouch island, in Prince William sound, for \$1,000,000, of which \$100,000 was paid down. The copper properties sold are in Prince William Sound district and on Lakina, Kuskulna, Kotzina, Kinnikat and other interior rivers. The next steamer leaving Seattle, Wash., for Prince William sound will carry considerable machinery shipped by Manager Gage, including diamond drills.

ARIZONA.

COCHISE COUNTY.

At the Lake Superior & Pittsburg, near Bisbee, shaft No. 2 is down 1000 feet and shaft No. 3 is down 800 feet. At present work is being interrupted by an extra amount of water, which has to be pumped out and carried a distance in launders to prevent its flowing back into the mine workings, says the Review.

The El Capitan M. Co., which has been developing a group of claims near the Lime Kiln, north of Tombstone, has closed down for the present under orders from headquarters at New Orleans, La.

The Turquoise M. Co., W. H. McKittrick, manager, who resumed work on their group of claims near Gleason April 1st, have a diamond drill in operation and report satisfactory results.

The foundation for the smelter at Benson has been laid, it being built on the site of the one destroyed by fire, and will have a capacity of 100 tons daily. Some of the machinery is on the ground.

Michigan men have organized the Arizona & Michigan Development Co., to operate a group of sixty claims adjoining the Mitchell Development Co., in the Huachuca mountains, near Bisbee. Copper, gold and silver values are found.

At the Marquette & Arizona, near Bisbee, the hoist is in operation and sinking has resumed.

GILA COUNTY.

(Special Correspondence). — The Black Warrior C. Co., Amalgamated, at Black Warrior, report opening up a body of ore in the lower level, assaying 20% copper. The reduction works have resumed operations. J. A. Fleming is president.

Black Warrior, May 1.

M. L. Shackelford and M. C. Jolly of Prescott are reported to have located deposits of asbestos in Tonto district, 35 miles from Globe. They say the asbestos shows 3 miles long, 5 feet wide, on the surface.

The Arizona-Colorado Copper Belt & Gold M. & M. Co. report a strike made at a depth of 85 feet in the shaft being sunk

on the mine at Globe. The workings also struck water at this depth, which will necessitate putting in a pump and additional power. The vein found carries lead, silver and some copper values. Arrangements are being made to put in a pump and steam hoist. Work will continue, however, on other portions of the group, which consists of seventeen claims adjoining the Old Dominion, says Manager R. M. Foree.

GRAHAM COUNTY.

The Stevens Copper Co., near Murenci, have put in a 15 H. P. gasoline engine on a winch, in the tunnel, which is being sunk. The tunnel is in 1250 feet and is expected to cut the vein 350 feet farther in.

MOHAVE COUNTY.

(Special Correspondence). — J. Carroll reports finding silver ore near the Juno mine, a mile northwest of Chloride, and is sinking on a dike, the vein matter continuing to show values.

Contractor Sterzle, running a 100-foot drift on the 500 level of the Tennessee mine, is making good headway, though the rock is hard. The 100-ton mill is crushing steadily on ore from other parts of the mine.

The Elkhart mine was examined last week by prospective buyers. The mine is producing milling ore for the 100-ton concentrator, as well as ore for shipment. The strike made at the Dempsey & O'Dea mines, across the valley from Chloride, is showing up satisfactory values.

The ore body in the 150-foot shaft of the Fourth of March mine, east of Chloride, is increasing in size and value, gold values predominating.

The O. K. mill, in Gold Basin, is handling 100 tons of ore per day, which capacity is proving insufficient for the output of the mine, and breaking ore has been stopped in some parts of the underground workings. The mine has been shipping for some time. J. Godfrey is superintendent.

Dryden & Schemmelpennig, who shipped a carload of ore from their lease on the Altata mine last week, got returns of 106 ounces silver, 24% copper and \$2 gold per ton. They are getting another shipment ready.

The Southwest Turquoise Co. has incorporated at Mineral Park and taken over a number of turquoise claims in that district. W. J. Tarr of Los Angeles, Cal., is manager. — Ore is reported struck in the Rico mine, near Todd Basin, owned by H. Lovin and W. Clack of Kingman, which assays ten ounces in gold with values in silver.

Ore has been struck at the Midnight mine, near Niggerhead. The 40-stamp mill at the Leland mine will begin crushing next week on ores from the Gold Road mine at Acme.

Chloride, May 1.

H. F. Best of Savannah, Mo., president and manager of the Treasure Hill M. Co., operating at Stockton Hill, near Cerbat, says men have been put to work sinking the main shaft. A whim will be put up. L. M. Teale is superintendent.

R. A. McMullen, of West Superior, Wis., and W. J. Tarr, of Los Angeles, Cal., have bought several turquoise properties in the Mineral Park section, near Kingman. They expect to organize a company for mining the stone and building a lapidary plant in Los Angeles.

Parties owning the McCracken silver mine, 12 miles from Signal, are preparing to resume after an idleness of twenty years. Their mill is at Signal and was transported by means of a traction engine.

PIMA COUNTY.

(Special Correspondence). — J. P. Owens, general manager of the Sierrita M. & M. Co., has had Eastern men examining his mines. Besides the Sierrita mines, Mr. Owens has the Oro Blanco and Sorrel Top. Recent developments have demonstrated the gold values of these properties and abundance of water has been found in one of the shafts. These companies will erect reduction works. Mr. Owens has systematically blocked out the ore bodies.

Tucson, May 1.

The Old Boot copper mines in Silver Bell district, 65 miles north of Tucson, have been sold to E. B. Gage et al., comprising the Development Co. of America, for \$700,000. The same company owns the Congress gold mines and the Tombstone Con. mine at Tombstone, Cochise county.

PINAL COUNTY.

The Chicago owners of the Vulture mine, near Florence, are preparing to resume. Preliminary work has started and it is intended to sink a 1000-foot shaft, says the Blade. G. W. Sanders is superintendent.

YAVAPAI COUNTY.

(Special Correspondence). — The Burlington G. M. Co., operating in Big Bug district near Prescott, have struck an 18-

inch streak of ore that runs \$300 per ton in gold. They have one shaft down 200 feet and are starting another. This property is 1 mile east of the Postmaster mine on Big Bug, and near the P. & E. railroad. The company will put in a hoisting plant. H. A. Suttle, Peoria, Ill., is secretary and treasurer.

Providence, May 2.

A hoist will be put in at the Peck mine, near Prescott. The shaft, which is being sunk on new ground, is down 70 feet, and they have struck ore which goes seventy-five ounces per ton in silver. Six different leases have been granted, the lessees all working above the 250-foot level. They are taking out ore running 250 ounces per ton in silver, says the Journal-Miner.

Manager G. P. Harrington of the Tiger G. M. Co.'s Grey Eagle mine, in the Bradshaw mountains, southeast of Prescott, says he has sixty men at work. The 10-stamp mill is running steadily, making four tons of concentrates a day, the shipping points for which are Kirkland and Middleton stations. Additional machinery will be put in at the mine.

Work has resumed on the Bunker Hill mine, near Prescott, and two shifts are taking out shipping ore.

The mill and cyanide plant of the Gold & Copper Con. Co., on the President group, 12 miles south of Prescott, are running steadily.

The Bannie M. Co., near Prescott, has finished grading for the hoist, which is expected to be in operation by May 20.

J. Howell says the Gold Link M. Co. at Santa Maria expect to have their 20-stamp mill in operation by June 1.

Manager A. J. Pickrell reports having done 5000 feet of work on the Rockefeller mine, near Big Bug, since taking charge, and the shaft is down 700 feet. Between the fifth and sixth levels \$40 ore was struck near the Poland mine.

YUMA COUNTY.

The Arizona Placer Extraction Co. has been incorporated at Quartzsite, with M. H. Bohrer, president of the Desert Queen Co., as manager. This makes the seventh company organized in this district, all of which are practically under one management, says the Bisbee Miner.

The Socorro mine at Harrisburg has resumed operations with sixty men at work, says President J. C. Pratt of Hartford, Conn., who has been supervising the erection of the buildings and enlargement of the mill, as well as development work. A cyanide plant and an electric lighting plant have been added. The cyanide plant is double-decked and arranged for sluicing the tailings, says Pratt. — At the Planet mine, on Bill Williams Fork, Superintendent McCann is sinking another incline on the west side of the gulch to strike the ore shoot that crosses the gulch from the old workings.

CALIFORNIA.

AMADOR COUNTY.

Further improvements are proposed this season in the Bay State, Kretcher and Rhetta mines, controlled by the Rhetta Con. G. M. Co., near Sutter Creek, says J. Ross, Jr., of Sutter Creek, a director.

CALAVERAS COUNTY.

The Western Mines Co. have bought the Quartz Glen lode claim, Quartz Glen placer claim and Atwood placer claim, with buildings, machinery, tools, water rights, ditches, etc., near Rich Gulch.

The tunnel of the Jack Rabbit drift mine, near Angels, is in 950 feet, leaving 80 feet to be run to reach the channel. Little water has so far been found, says Superintendent F. R. Purlington.

The Benson mine, near Angels, has started to sink, the shaft being down 100 feet, and will go to 500 feet.

A strike is reported made in the east drift of the Star of the West mine at Rich Gulch, 6 miles east of Mokelumne Hill, showing free gold in quartz.

The new hoist built by the Gwin M. Co. at Gwin Mine, near Jackson, is in operation, says Superintendent D. McClure.

DEL NORTE COUNTY.

More men have been put on at the Haynes Flat placer mine, near Crescent City, says the Del Norte Record. New ditches are being made and others rebuilt. A sawmill will be built to make lumber for houses and fluming.

The Chinese Co., mining at Big Flat, near Crescent City, are piping, and a partial cleanup while overhauling the race last week showed satisfactory results.

EL DORADO COUNTY.

W. Dixon reports having struck a body of ore in the Revenge mine, near Greenwood, and he proposes putting up a small mill.

Superintendent Allen of the Havilah mine at Nashville says lumber and sulphides are being hauled in and the mine will

be reopened after an idleness of several years. The shaft is down 800 feet, and there is a 20-stamp mill.

Development work is going ahead at the Del Monte mine on the American river, a few miles below Coloma. The Monte M. & M. Co., recently organized by Sacramento men, intend to thoroughly develop the property. A millsite is being graded for a 5 stamp mill, and work on a ditch to convey water from the river for power purposes began this week. The tunnels have been retimbered and work resumed in the lower tunnel.

C. Waller of San Francisco, a director of the Zimmerman gravel mine at Placerville, says development work will be resumed May 10 with twenty-five men. Two three-drill air compressors are on the ground and are being set up. A tunnel 1200 feet in length will be run to tap the gravel channel.

It is reported the Zantgraf mine, near Auburn, will resume under new management.

FRESNO COUNTY.

The Wabash Oil Co. has entered the Coalinga field, buying out the Grant Oil Co., and has resumed drilling the well, which is down 600 feet. R. J. Dickson, of the El Capitan, is field manager for the company, and W. Ingels of Fresno president.

The rig that was destroyed by fire on the California Oil Fields, Ltd., at Coalinga, has been rebuilt and drilling resumed.

INYO COUNTY.

(Special Correspondence). — The 20-stamp mill at the Reward mine started up on the 1st inst. for its trial run. — The low-grade gold mines in the Alabama hills, near Lone Pine, are being reopened, with a number of miners on development work. — The Roosevelt Oil Co., operating near Haiwah Meadows, have a hole down 1000 feet, with favorable indications. — At Cerro Gordo T. Boland has eight men at work and is running his jig and concentrating plant, and a team makes daily trips to Keeler loaded with concentrates. — On the Morning Star mine development work continues, drifts being extended on the 350-foot and 450-foot levels, and the vein is being crosscut.

Cerro Gordo, May 4.

KERN COUNTY.

The Bakersfield to Point Richmond pipe line of the Standard Oil Co. is in operation as far as Corcoran, the end of the second 28-mile section, and the oil tanks at that station have been filled. The next two sections have been tested by water and are ready for the oil, which flows all right as soon as the pipe becomes warmed up. The line is cold, and the only difficulty experienced is from this fact, says the Reporter. Once it becomes warm it will never be allowed to get cold, as the oil will be run uninterruptedly. When the line is full it will contain 100,000 barrels of oil, and the tanks along the line will contain 200,000 barrels more.

LOS ANGELES COUNTY.

The Octave Oil Co. has incorporated at Whittier. D. Murphy, T. A. O'Donnell, G. Holterhoff, Jr., W. I. Hollingsworth and R. H. Lacy.

MADERA COUNTY.

(Special Correspondence). — The Star mine, on Mount Raymond, 5 miles east of Fish Camp, on the Yosemite road, is being reopened by P. and D. Clark of Spokane and Republic, Wash. This property was extensively equipped and slightly developed about fifteen years ago by a Montana company. An aerial tramway about 6000 feet long was put in, connecting the mine with a concentrating mill of 150 tons capacity. The ropeway passed over an intervening spur of the mountain, about 350 feet above the mine dump, and descended on the opposite side a vertical distance of nearly 1500 feet to the mill. The ore bodies occur in diorite and are mineralized shoots in crushed country rock. In some places solid masses of ore—lead, zinc, copper and iron sulphides carrying silver and some gold—occur. The ore bodies are large, if surface indications can be relied upon. They range from 5 or 6 feet to over 50 feet in width and have considerable longitudinal extent. Development work was commenced last fall and a crosscut tunnel driven 600 feet under the ridge previously mentioned, to reach the ore bodies in depth and to obviate the necessity in the future of transporting the ore over the ridge which intervenes between the mill and the mine. The mill is at an elevation of about 7500 feet above sea level and the mine at nearly 9000 feet. The ore contains chiefly lead and zinc sulphide, with silver, and it was due to the relatively large amount of zinc present that the former company discontinued operations; but, with the use of modern separators, it is expected the mill will produce a clean product.

Raymond, May 4.

MONO COUNTY.

At Bodie, the Standard Con. M. Co., regular operations continue with usual number of men at work. The South End mines are not running, but operations are expected to be resumed this summer. The Syndicate mine is running as usual and the mill was started last week. Work is being done at the Boston Con., and ore is accumulating in the bunkers.

In Sweetwater district, near Bridgeport, the Sweetwater Con. M. Co. will put on more men, the mill will be enlarged and additional machinery put in, says the Chronicle-Union.

NEVADA COUNTY.

Los Angeles men, including H. S. Smith and E. J. Delano, have an option on the Boss mine at North San Juan. The mine is owned by Page, Harding & McCutcheon of San Francisco, and has a Huntington mill and hoisting works. The shaft is down 127 feet. There is a large body of low-grade ore, averaging \$3 per ton in gold. It is intended to build a larger mill and hoisting works.

Manager C. Christopher of the Peabody mine, near Grass Valley, says the workings have been unwatered, and the shaft, pump rods and pump (which is at the 400-foot station) were found in good condition. It is reported the Ocean Star mine at Ormonde, near Grass Valley, will be started this month. The property is under bond to the Red Cross Co., F. Enzensperger, president.

Superintendent Brunnier says he has lowered the water in the Conlin mine, near Grass Valley, sufficiently to enable him to put men at work in the 500 level. The last heavy storm, which flooded so many mines, sent a large quantity of water into the Conlin. At the Lafayette, which the company also owns, work is progressing. The tunnel is being run on the vein.

Pumping operations have begun at the South Idaho mine, near Grass Valley, which is an extension of the Idaho mine. It is expected to be unwatered by May 10th, says Superintendent J. E. Carter. The bottom workings are down 150 feet.

At the Coe mine, on the Grass Valley and Nevada City road, near Grass Valley, Superintendent C. B. Lakeman, in drifting for the ledge which had been lost, struck a 10-foot vein on the 1000-foot level last week. It shows values in pyrite and galena.

Manager F. S. Morgan of the Pennsylvania mine, near Nevada City, reports opening up a body of free-gold ore on the 500-foot level, being a ledge not previously known. The find was made 400 feet north of the shaft, and 100 feet beyond former workings. The 10-stamp mill being built is expected to be in operation by May 10.

Preparations are being made to further develop the Ironclad mine, near Rough and Ready. Larger pumps will be put in and as soon as the mine has been unwatered underground work will begin. G. C. Day, principal owner, says he has interested Los Angeles men in the mine. The old pumps were unable to handle the volume of water which was struck with depth, and for some time the mine was worked but little.

PLACER COUNTY.

Local reports say the Sacramento M. & Dredging Co. of Sacramento proposes to operate on the tailings produced by the hydraulic mines of Iowa Hill and Gold Run, near Colfax, which emptied into the American river for a period of forty years. Beneath these tailings, it is thought, in many places lie bedrock gravel, which has never been disturbed.

The work of unwatering the Calf Pasture mine, near Auburn, is progressing.

The Nissen quartz claim on the Colfax and Forest Hill road has been sold to Russell et al. of San Francisco for \$8000.

The Bob mine, $2\frac{1}{2}$ miles above Auburn, is showing up well, says the Sentinel, and seven men are on development work. Drifts are being run and last week a new shaft was started. It is stated the company intend to build works on the American river several hundred feet below the mine, and a tunnel may be run from that point.

The Pingston mine, near Colfax, has closed down for an indefinite period, says the Sentinel.

The Gaylord mine, 2 miles east of Newcastle, is being reopened. Pay dirt was struck on this ground forty years ago. A company has been formed to operate the property and prospect for the channel in Long hill and a millsite and right of way for tailings bought.

SACRAMENTO COUNTY.

The Hupp & Roberts M. Co., which recently closed down its mine on the Perrazzo ranch, near Folsom, will prospect the ground with a drilling machine. The Old Homestead Co. is prospecting the Borges ranch, at Negro Hill, under bond.

SAN DIEGO COUNTY.

The Western Oil Co. has been organized at San Diego, to operate near Nestor, E. A. Hornbeck, E. Thelan, F. H. Samborn, J. A. Samborn, T. S. Kellett, S. K. Williamson and G. Putterbaugh.

Marr & Middaugh of Colorado Springs, Colo., have bought the Deer Park group of mines, near Descanso, and intend to begin development work next week. Additional machinery will be put in.

J. A. Rowand has a bond on the Owens mine, near Julian, by the terms of which he agrees to sink the main shaft 600 feet deeper—a total of 1000 feet, says the Julian Miner.

SAN MATEO COUNTY.

The Pilarcitos Oil Co., at Halfmoon Bay, report drilling in progress, and they are down 600 feet.

SANTA CLARA COUNTY.

Surveys have been made for a pipe line from the Watsonville Oil Co.'s wells near Sargents to Sargents station, where a storage tank will be placed so that cars may be loaded from a sidetrack.

SHASTA COUNTY.

A strike is reported made in the shaft of the Midas mine at Harrison gulch, near Redding, at depth of 700 feet. A drift started south on an 8-inch stringer, in 15 feet, widened to 3 feet, showing free gold.

C. H. McClure has bonded the Ariade and Lone Star quartz claims, adjoining the Miles claims, which he also has bonded on the east side of Squaw creek, near Winthrop (De Lamar).

W. G. Scott, local manager of the Great Western G. M. Co., superintending development work on the Afterthought copper mine, near Bella Vista, says an ore body is being opened up on the 200-foot level. An air compressor and machine drills will be put in. Most of the smelter machinery has arrived at Bella Vista.

Operations were resumed at the De Lamar smelter at Bully Hill at Winthrop on the 2d inst. The furnace was blown in and 250 men are now at work. It is proposed to build another furnace this summer. There is sufficient ore already roasted to keep the smelter running for several months, says Superintendent Keating, and the ore that is being mined and roasted insures a continuous run.

Washington advises state A. B. Searl, topographer United States Geological Survey, will, during the summer of 1903, take up the work of mapping an area of 40 square miles in Shasta county. All mines and prospects will be located, as well as all houses, roads, ditches, trails, etc. The survey will embrace the Bully Hill district, near Copper City, De Lamar and Salee, and those sections lying between and including the properties of the Iron Mountain C. Co., the Trinity C. M. Co. and also the Uncle Sam, Mammoth and Summit mines.

TUOLUMNE COUNTY.

The shaft in the Campo Seco mine, near Jamestown, is down 150 feet and a drift started.

The Chaparral quartz mine, near Groveland, has been bonded to J. R. Johnson for \$10,000. S. M. Cox has bought a one-fourth interest in the Ready Relief quartz mine, near Sonora. S. A. Knapp of Tonopah, Nev., has bought the A. G. Wedekind claims and all interest in the water ditch and water right, which commences on the south fork of the Stanislaus river at the mouth of Experimental gulch, near Columbia.

F. Baker has bought a one-quarter interest in the Marlow mine, with all water rights and ditches, including 800 inches water right of Long gulch and 1000 inches of Turnback creek, near Carters.

The El Rico M. Co. has incorporated at San Francisco to operate the Bell mine, near Tuttletown. S. D. Woods, G. W. Myers, J. Spiers, W. J. Rule, T. H. Johnson, T. S. Bullock, W. Hewitt and P. S. Reardon. W. J. Rule is superintendent. The shaft is down 508 feet and in ore, and drifts and crosscuts have been run on all but the 500-foot level. It is intended to put in an air compressor and build a 10-stamp mill.

The tunnel of the Over mine, near Sonora, which tapped the shaft 1000 feet from the surface has been extended 500 feet to the south. The operators have leased additional ground.

The Marian and Marguerite quartz mines in Yankee Hill section, southeast of Columbia, have resumed.

Twenty-five men are at work at the Doyle gravel claim, near Columbia, under the management of W. S. Estey and R. Stanford, with O. Doyle as foreman. The hoist is in operation and good gravel is reported being taken out. Washing of the gravel was delayed by making a lower grade to the ditch, which was finished last week. The shaft is 125 feet deep and there are 150 feet of drifts on the east rim

with center of the channel not in sight, says Estey.

The stamps were started dropping in the mill at the John Royal mine, near Columbia, last week, says Superintendent W. A. Holmes.

The P. Shine placers, consisting of fourteen acres at Columbia have been bonded to J. M. Meighan, J. M. Butenuth and a San Francisco man, who will prospect it.

The tunnel in the Stenchfield gravel claim on Table mountain, near Columbia, has been cleaned out for 1000 feet by G. Bolter, R. Thomas, J. and C. Sullivan, and a bed of pay gravel has been opened up.

The Norwegian mine, near Tuttletown, has resumed, after a temporary shut-down.

VENTURA COUNTY.

The Pacific Coast Oil Co. has completed a pipe line to the Modesto field, north of Piru City. The oil will be piped to the Ventura tanks of the company.

The Santa Paula-Satcoy Oil Co. has been incorporated in San Francisco, A. C. Hellman, W. H. Morrow, B. G. Haskell, S. V. Smith, W. A. Costello, directors, to operate near Santa Paula.

YUBA COUNTY.

The Sebourg & Davis mine and mill near Rackerby have been sold and other claims in that district secured by purchase or bonding to L. H. Mitchell and F. E. Wright, with San Francisco men. Wright says the claims bought and bonded cover 500 acres, the two principal mines being the Spanish mine and the Sebourg & Davis mine and mill, though they have thirteen other claims. Men are at work taking out quartz and the mill is expected to be in operation by June 1. It has a capacity of sixty tons daily. The vein is 15 feet wide, carrying gold values.

COLORADO.

BOULDER COUNTY.

Manager Habriei of the St. Louis mine, near Caribou, has started up the concentrating mill again, having closed down last fall on account of a scarcity of water, but kept the mine working steadily.

Superintendent Grove has resumed operations at the Silver Point mine, near Caribou, and will sink the shaft 100 feet before starting another level. This mine is near the line of the United Gold Mines tunnel.

M. A. Smith and R. D. Stratton of New York, owners of the Northwestern mine, have resumed operations. Their ores carry values in gold, silver and copper. J. Jester is superintending the retimbering of the shaft. Additional machinery will be put in as soon as the roads are in condition. They intend sinking the shaft 250 feet, a total of 500 feet. As soon as the United Gold Mines tunnel reaches their ground they will sink to the level of the tunnel and connect with it.

CHAFFEE COUNTY.

E. T. Bowan is prospecting his granite quarries near the Ethel mine, near Turret.

CLEAR CREEK COUNTY.

A suspension of operations was caused at the property of the Oro Verde M. & M. Co. at Yankee last week on account of a break-down of the machinery. The company propose to erect its own mill this summer, put in an air compressor and increase development work.

A 3-foot ore body, carrying telluride, was opened up last week in the Treasure Vault mine in Virginia canyon, near Idaho Springs. J. W. Ward is part owner.

The Cedar Ridge M. & T. Co. was incorporated last week to operate a group of six claims on Santa Fe mountain, near the Coming Nation mine, near Georgetown. Their tunnel will parallel that of the Gold Plane Co. The incorporators are: W. A. Kalp of Mt. Pleasant, Pa.; J. D. Pierson of Kenton, Mich.; J. M. Sterling of Bridgeport, Conn., and P. M. Egart of Holland Patent, N. Y.—The Con. Gem M. Co. is building a machine shop at the Newton mill.

Five mines, near Idaho Springs, were closed down on the 2d inst. by a strike, due to a demand for an eight-hour day, the miners going to work on their own time and off on company time. This the companies refused to grant.

The Gladstone and Big Medicine groups, near Silver Plume, recently bought by the Arizona M. & Dev. Co., has begun operations, with F. A. Babcock, former owner, as superintendent. The mines are on Sherman mountain, east of the Wisconsin mine. The main tunnel of the Big Medicine cut the lode at a depth of 235 feet. A drift was run on the vein 420 feet, to where the lodes cross, at which point the ores gave returns of 152 ounces silver, 25% lead and \$5 in gold. An upraise of 40 feet shows quartz with glance, gray copper and lead. The main office of the company is at Oklahoma, I. T.

CUSTER COUNTY.

Near Rosita, Hendershoot & Nelson are working the Lucille, and have driven 300 feet of tunnel. They report opening up the vein between granite walls, which gives values of 100 ounces silver and \$6 in gold per ton.

Augustine Bros. are working a contract on Tip Top Nos 1 and 2. A company has been organized to work the lead and copper properties in Titusville district, near Silver Cliff. The King of the Carbonates at Westcliffe will resume.

More men have been taken on at the Toledo mine near Custer City. The management is running levels at 300 and 500 feet northwesterly to locate the ore body. The work is progressing. It is reported the Game Ridge silver mine, which has been idle for some time, will be reopened by Cincinnati men.

DELTA COUNTY.

L. B. Morris, assistant general manager of the Waunita Coal Co., says they are opening up their coal mines in the North Fork valley and midway on the river between Somerset and Paonia. The company owns 5000 acres of patented land lying on both sides of the North Fork of the Gunnison river, and they have a tunnel driven in on the coal for 600 feet. The coal is being hauled to the switch until their siding, tramway and tipples are built. Morris says this company are also operating in the southern part of the State and from one mine have a daily output of 1000 tons, which is handled principally over the Rock Island and Burlington railroads.

FREMONT COUNTY.

The United States smelting plant at Canyon City is being rapidly rebuilt. Eight carloads of steel for building bag houses are on the ground which is expected to be in place by May 20. The machine shop is ready for the machinery and the refinery and cooper hops are completed. All the buildings but bag houses will be larger than before. Two steel power houses are an addition, also ore and coal bins.

An oil strike is reported made in the Florence field by the Keystone Oil Co., owning 1400 acres 3 miles east of Florence. The drill broke into the flow at a depth of 2400 feet. It is expected to produce 200 barrels a day. Prospecting will continue on other parts of their holdings.

GILPIN COUNTY.

It is locally reported a company is to be formed to consolidate and operate the Portage, Blanche M., Lynne, Randolph Extension and El Dorado mines, near Russell Gulch, with S. T. Harris manager. At the Portage shaft a whim will be put in for present sinking operations. The bottom shows 5 feet of ore with a 6-inch shoot of sulphides on both walls. A new shaft will be sunk on the El Dorado, to be the main shaft of the group. This shaft will be sunk 200 feet west of the present shaft, which is down 200 feet.

During April the Fairfield G. M. Co., operating the Fairfield mine, in Russell district, shipped daily a cord of milling ore to the Hidden Treasure stamp mill at Black Hawk and four cars (seventy-five tons) of smelting ore to the Denver smelters. The milling ore averaged three ounces gold per cord and the smelting ore \$100 per ton. The mine is operated on a lease and bond, with W. M. Nickerson manager.

For the last week of April the shipment of smelting and crude ores, tailings and concentrates from the Black Hawk depot to the Denver smelters and to the Idaho Springs mill amounted to forty-seven cars or 940 tons, making total shipments for April 231 cars (4620 tons), being lower than the average, due to stormy weather and the continued shut-down of the Golden smelter.

J. C. Fleischutz, manager of the Roderick Flu and Protection gold mines, near Central City, has men retimbering the Roderick Flu shaft and is down 80 feet. A hoisting plant capable of sinking 1000 feet is proposed. The Gilpin County Tramway Railroad is built to the dump and timbers and coal can be hauled to the mine and on the return trip the ore sent to the mills at Central City and Black Hawk.

GUNNISON COUNTY.

The Dora M. Co. has resumed work on its placers in Union park, west of Tincup. The company owns 720 acres of placer ground and have built two reservoir dams, one of 400 feet and the other of 1000 feet, and several miles of ditch work and fluming.

LAKE COUNTY.

It is locally reported a deal is under way for the sale of the Resurrection mine, near Leadville, to the Western M. Co. (Guggenheim Exploration Co.), S. D. Nicholson, manager. The Resurrection mill is handling 110 tons daily of lead, zinc and iron ore.

Electricity will be used in the new mill near the Arkansas Valley smelter at Lead-

ville for the treatment of ores from the Yak tunnel. Electrical and magnetic devices for the separation of zinc will be used.

Company work has ceased temporarily on the Fanchon mine, near Leadville, but some of the subleases are working. The company expect to sink the Fanchon shaft another 100 feet.

H. J. Gaw, part owner of the President mine, near Leadville, says they will resume this month.

OURAY COUNTY.

A strike has been made in the Mickey Breen mine in Poughkeepsie gulch, near Ouray, says Superintendent F. M. Jackson. The values are principally silver and lead. The ore is being sacked and placed in the bin at the Mickey Breen mill, which will be put in operation by May 15. The concentrates will be packed down to the Red mountain and Ouray wagon road and hauled to Ouray.

SUMMIT COUNTY.

The G. M. K. M. Co. has incorporated under Colorado laws by Texas, Oklahoma and Colorado men, and began work last week on the Meagher group, being twenty-five acres of ground covering the extension of the Robinson ore shoot No. 1, at Robinson. The shaft is 160 feet deep and they propose to sink another 100 feet and begin drifting. A. M. Gaines is manager, and E. W. Kimber of Hobart, Okla., F. M. Bailey and C. A. Morris, of Texas, are interested.

TELLER COUNTY.

The values of the output of Cripple Creek district for April aggregated \$1,702,650; the tonnage for the month being 51,050 tons. This is an increase in value of \$506,501 over March, while the tonnage has decreased 524 tons. One of the features in bringing down the value of the total tonnage, says the Colorado Springs Gazette, is the starting up of the Magna Charta and Gillette cyanide plant; and the total value would have been further decreased had not the Aequa mill burned down during the first of the month. The figures for the month obtained from the mills and smelters are as follows:

Name.	Tons.	Av. Value.	Total Value.
U. S. R. & R. Co.	20,000	\$25.00	\$500,000
Portland.....	7,500	25.00	187,500
Economic.....	4,200	27.00	117,400
Telluride.....	3,500	25.00	87,500
Dorcas.....	3,200	27.50	88,000
Magna Charta..	300	4.00	1,200
Gillette.....	350	3.00	1,050
Smelters.....	12,000	60.00	720,000
Total.....	51,050	\$25.00	\$1,702,650

A lease on the Lost claim on Mineral hill, near Cripple Creek, has been given to G. Anderson for eighteen months at 15% royalty.

The El Paso Gold King at Cripple Creek has out the main water channel of the district, says the Times. The water channel was opened in the drift at a depth of 900 feet, and during the past few weeks the water has been rising in the shaft. The past week the pumps have been raising 1000 gallons a minute, the result being the water has only been lowered 2 feet in the shaft during that time. Whether or not the company will continue to pump this amount of water is not known, as it is thought that when the drainage tunnel is completed in August water will not longer bother them.

The Cripple Creek Enterprise G. M. Co. at Cripple Creek is drifting and cross-cutting in the 200-foot level. The drifts are being extended southeast and northwest, the former to cut the National Hotel vein, while the latter is expected to cut the vein opened at the surface on Fifth and Carr avenue. Eighty feet of work has been done, says Manager Hanley, and he does not expect to reach ore in paying quantities until 200 feet from the shaft is made.

Of the ten sets of lessees and sub-lessees operating on the Bonanza King group at Cripple Creek all are getting out ore. They are operating from surface down to depth of 350 feet. The best ore and largest shipments are being made by the Gold Cord Co., having a lease on blocks Nos. 11 and 14. The shaft is down 240 feet, where a drift is being run. A body of ore was opened up in a drift off the 150 foot level and the drift which is being run from the bottom of the shaft is to get under this ore. The streak found in the 150-foot level is 14 inches wide and gives values of three ounces in gold per ton.

The United G. M. Co. report striking the ore body last week in the 600-foot level of the Deadwood mine, near Cripple Creek. The company is making a carload of ore a day from the mine.

In the Wild Horse development is progressing.

On the Silver Tip claim, up the hill, at a depth of 40 feet, lessees are breaking ore 2 feet in width that averages \$40 per ton in gold.

A carload of ore was sent out this week

from the south half of block seven of the Cameron school section, near Cameron, under lease to the German American M. Co. The ore is coming from a depth of 157 feet in the shaft, the vein showing 4 1/2 feet in width, average value \$20 per ton. The main shaft is down 178 feet, at which depth another vein has been cut. At 157 feet a crosscut has been run 95 feet to get under a vein found at 80 feet depth. At this point a winze is being sunk on the vein to connect with a drift from the shaft. The company also continues sinking the shaft.

The Economic mill, near Cripple Creek, is running steadily, treating an average of 180 tons of ore per day, but this month there is expected to be an increase.

IDAHO.

BANNOCK COUNTY.

The Juanita M. & M. Co. has incorporated at Ogden, Utah, to operate the Juanita, Resort, Hard Cash and Fleetwood claims in Port Neuf canyon, between Pocatello and McCammon; A. Patterson, C. C. Behler, H. Perkins, J. Kinney, F. W. Mozenett, J. Coyle, A. Hodgins, O. O. Johns are incorporators, and the principal place of business Ogden, Utah.

BLAINE COUNTY.

Work in the shaft sunk in the Dithmer group, in Colorado gulch, near Hailey, to determine if the body of galena struck continues in depth, had to be discontinued last week because of the inflow of water which necessitated the driving of a tunnel to drain it. It will be driven 275 feet as a crosscut, then continued in the ledge to the ore body, giving 400 feet of back.

At the Minnie Moore mine, near Bellevue, machinery has been placed in the new hoist and underground operations were resumed last week. The recent strike in the Tip Top mine on the gold belt, 11 miles west of Hailey, owned by J. Q. Packard of Salt Lake City, Utah, was made on the 1100-foot level in the shaft. There are twenty miners at work, and the stamp mill is running steadily.

IDAHO COUNTY.

Roosevelt reports say the shortage in food supplies in Thunder Mountain district is causing great inconvenience. Meat is 40 cents a pound, and coffee, sugar and tobacco correspondingly high. What supplies are coming in are sent by mail and registered. It is reported that the 10-stamp mill at the Dewey mine will be enlarged.

SHOSHONE COUNTY.

The Gold Standard M. Co., operating on Pony gulch, near Wallace, is fluming its strippings over 200 feet of riffles in a 1700-foot flume and catching gold in paying quantities. As soon as the stripping is completed the hydraulic elevator will be put in operation cleaning the bedrock. This process will be repeated each year until the entire property is worked out. There is completed 1600 feet of the flume of the New Jersey M. & M. Co. on Big creek, near Wallace. There still remains 6737 feet to be built.

(Special Correspondence).—The Highland Chief M. Co. are opening up a property in the Coeur d'Alene, 3 miles south of the Bunker Hill & Sullivan mine. Two months ago they struck the ore body at a depth of 300 feet, cutting a large body, 8 feet of which is high-grade ore for that district. They are getting ready to place a compressor plant on the mine and expect to put up a concentrator plant in the fall. B. L. Grant of St. Paul, Minn., is president.

Wardner, May 3.

INDIANA.

DELAWARE COUNTY.

Albany reports say hundreds of acres of land are being bought up near Albany by oil promoters. Oil has been known there for a number of years. During the natural gas fever the Ohio Pipe Line Co. sank a large number of wells, and of these wells thirty bore oil instead of gas and were plugged. Some of them are said to have oil standing in them to a depth of 700 feet. Southeast of Albany are wells producing from 50 to 100 barrels a day.

INDIAN TERRITORY.

CHOCTAW NATION.

It is reported that H. C. Frick of Pittsburgh, Pa., J. W. Gates of Chicago, Ill., and G. Gould of New York have formed a pool for securing control of coal lands in the Choctaw Nation. A survey by the Geological Survey shows that there are 440,000 acres of these coal lands, and the pool has agreed to pay \$25 an acre for the entire area. At present all the coal mines in the nation are being worked under lease; but now that the allotment is to be completed, Secretary of the Interior Hitchcock has decided that it will be to the interest of the Indians to sell the lands outright rather than to continue the lease system under individual ownership.

The coal lands have been segregated and are to be sold at auction within a few months. The pool is said to have arranged with the companies now mining under leases to permit the companies to buy the lands they have leased. If any companies are not in a position to buy their lands, the pool will buy them and continue the leases at the present royalty of 8 cents a ton.

MICHIGAN.

HOUGHTON COUNTY.

The Baltic mine, near Houghton, is making a current output at the rate of 11,000,000 pounds of copper per annum. Rock shipments to the mill are 1640 tons daily, and as a result of some improvements under way at the mill it is expected a larger tonnage will be treated. The group south of No. 3 shaft, in the direction of Trimountain, is showing the best results of any portion of the mine, making it certain that the company will open a new shaft in this direction next year. North of No. 5 shaft appearances are said to be not as favorable. Forty-six machines are operated at the Baltic, of which ten are engaged at other than stoping work. The average cost per ton of rock handled and per pound of copper produced has been lessened the past year. The company has 600 men on the payroll.

The Osceola mill returns from the Kearsarge lode, near Calumet, show a mineral output for April, with the fifth stamp at the mill operating but part time, of 800 tons, from which the yield of refined copper was 75%. The refined output is dressing 2% higher than the average of last year.

The April output of the Wolverine mine, near Calumet, amounted to 499 1/2 tons, the total being cut down by the strike of the trammers.

MONTANA.

Following is the output of the two principal gold producing counties for April:

	1903.	1902
Fergus.....	\$109,127 19	\$19,531 32
Lewis and Clarke.	27,714 02	33,615 43

During April the Government assay office at Helena received \$206,938 63, as compared with \$137,803.36 in April, 1902, an increase of \$69,135.10, Montana mines shipping \$172,365 27, as compared with \$103,312 27 during April, 1902.

FERGUS COUNTY.

H. McEvony & Sons are working their Big Six group of mines near Gilt Edge. The ore is oxidized and amenable to cyanide, assaying \$6.

FLATHEAD COUNTY.

The Spokane & Montana M. Co. has incorporated to develop placer and quartz mining claims near Libby; G. Robinson of Libby, F. M. Fortune, J. F. Collins, O. W. Ames and E. Denzer, all of Spokane, Wash. Their holdings include the Keystone, Galt, Blue Bird, Mary Gold, North Star and others.

GALLATIN COUNTY.

T. H. Barlow and H. C. Armstrong are developing near Bozeman a deposit of asbestos and will make a sample shipment next week.

T. Machiner & Co., who are developing copper claims near Bozeman, report having struck a 6-foot vein carrying 6% copper, with some gold and silver.

JEFFERSON COUNTY.

Trial shipments of ore from the Bullion mine of the Cataract group, near Basin, are reported showing favorable results, and contracts for further development work will be let. It is said a concentrator will be built to work the second-class ores of the Gray Eagle mine. A car of ore from the Silversmith netted \$3300. Regular shipments are being made from the Hiawatha.

LEWIS AND CLARKE COUNTY.

The Inter-Mountain says Martin & Canol of Helena are working several properties near Helena. From the group in Hell Gate canyon, which they have been working for three years, they have shipped in the last four months \$10,000 of ore which runs 20% copper. A concentrator is being built at the mines to work the second-class ore, which runs 10% copper, of which there are several thousands tons on the dump. It is expected to be in operation by June 10. The ore shoot averages 18 feet in width with 5 feet of shipping ore. Martin & Canol are also working on the Missouri & Montana Co. group (formerly the Sure Thing mine), adjoining the Ontario in Ontario district. It has been developed by a 700-foot tunnel run on the lead and the ore stoped to the surface, the greatest depth attained being 90 feet. A steam plant has been put up and a double-compartment shaft is being sunk, which is 80 feet below the tunnel. At 100 feet a crosscut will be run to the vein 20 feet and drifted both ways. The ore runs \$30 a ton and as soon as the roads are in condition shipping will begin, as

there is \$15,000 worth of ore broken in the old workings.

Placer miners of Alder gulch are preparing for a busy season, says the Madisonian. L. A. Fenner has begun operations on his ground. The Fenner washer has been repaired. Mr. Fenner and his sons are stripping ground.

J. Garrison has begun work on the Duncan, Garrison & Fehring ground at Adobetown.—The Consolidated Fluming Co. have begun operations with a few men, but will increase the number if the water starts.—J. Wilson is mining at the mouth of Hungry hollow.

H. White & Co. are leasing the Elling diggings above Pine Grove.—There is more snow on Mount Baldy this spring than for many years back. Under ordinary weather conditions, the flow of water will continue longer this year than usual.

The dredgers at the mouth of Alder do not depend on the water conditions for a successful season's work. Two of them have been running nearly a month, and the other, No. 2, will begin about May 15.

MADISON COUNTY.

The Gordon dredger has begun work for the season on the Conrey placers near Virginia City, and the second dredger will be placed in operation by May 15. The Chicago M. & D. Co. has started its dredgers in the Alder gulch placers.

The Granite Mountain M. Co., which owns fourteen patented claims in Summit district, near Virginia City, after an idleness of ten years, has resumed development work. A contract has been let to sink 200 feet on the J. T. C. mine, adjoining the Kearsarge. Much other work is contemplated in the district this season.

Thirty-five men are developing the Galena mine, near Pony, and a good tonnage of ore is being shipped.—The Red Bluff M. Co. has overcome the water question and are producing sufficient ore to keep its mill in operation.—At the Clipper, in same district, forty men are at work taking out ore of shipping grade.

MISSOULA COUNTY.

Missoula reports say the mines of the Bitter Root C. M. Co., at Saltese, are being examined by E. P. Gilman of London, Eng., for a Scotch company.

POWELL COUNTY.

Canol & Martin are resuming work on the Snow Shoe mine in Snow Shoe gulch, near Elliston, and expect to begin shipments this month. They will also ship from the Alice mine in Basin gulch, same district.

A. B. Clark and E. H. McDonald of Butte, M. S. Bradley and E. R. Woodlee of Chicago, Ill., are locally reported considering building a concentrating plant at Emery. Besides ore on the Emery Co. dump that could thus be profitably treated, there are several prospects yielding ore not high enough in grade for shipment, but could be treated by a concentrating plant.

SILVER BOW COUNTY.

Butte reports say the construction in Butte of a zinc smelter to treat the ores of that and adjoining camps that carry values in that metal is proposed, W. A. Clark and others being interested. Superintendent M. Buckley says Clark's Travonia mine would yield 500 tons per day of zinc ore. It is claimed that a number of mines that run heavily in zinc could be profitably worked, as they also carry by-products of gold, silver and lead.

At Rocker the Anaconda Co. has in operation a mine timber framing plant, which consists of a sawmill and other machinery especially designed for framing timbers for their mines there. The timber is unloaded from the cars at the plant and out and dressed to comply with the directions received from the mine in which it is to be used, the company thus saving the expense of hauling the useless portions of the timber up the Anaconda hill and then hauling down the waste. At Rocker the waste is burned in the boiler room furnaces. There are twelve men employed, with H. Crangle as foreman.

NEVADA.

ELKO COUNTY.

California men have bought the Enright group of mines, 100 miles north of Elko, and will develop the property.

ESMERALDA COUNTY.

In the Atwood district, 30 miles north of Luning, the principal work is being done by the Sierra Vista G. M. Co., composed of Tonopah men, with T. L. Oddie president. The company owns eight claims, says the Tonopah Miner. A shaft has been sunk 60 feet on a ledge of oxidized material which shows values in free gold, with a trace of silver. The extension of this group is owned by D. S. Cohn et al., who, in addition to free-milling gold, report having a vein showing values in copper and silver.

LINCOLN COUNTY.

V. A. Macdonald, vice-president of the

Providence E. & D. Co., has bonded the Juniper and Chiquita groups of mines in Newberry district, near Searchlight, and operations have begun.

NYE COUNTY.

The Teete River Placer M. Co. has incorporated at Tonopah to pipe water 16 miles for mining purposes.

High-grade ore is reported struck in the Ohio Tonopah mine at Tonopah, the strike being made at a depth of 735 feet in the shaft.

Manager M. J. Sheridan of the Rescue M. Co., at Tonopah, says the hoisting plant, consisting of a 45 H. P. steam engine and a 70 H. P. boiler, is in operation, and the two-compartment shaft is down 200 feet. The bottom of the shaft is in porphyry, showing assays of \$2 in gold.

The Pequot M. Co. will begin operations on their claims on Lone mountain, near Tonopah, by the 15th inst. On one of the claims a shaft 80 feet deep has been sunk and a 3-foot vein cut that carries \$60 per ton in gold and silver.

Sinking was resumed in the Montana-Tonopah last week and the main shaft is down 550 feet. Crosscutting and drifting continues at the 500 level. All the available recesses of the mine are filled with sacked ore and shipments will be made to the smelters at Salt Lake City, Utah. The shaft is being wired and arrangements made to put in an electric drill. The drill will be used in the crosscut and drifts.

At the Ray Extension mine, at Tonopah, a 22 H. P. hoist is being set up, and development work will resume next week. The shaft is down 100 feet in a contact between lime and quartzite.

At the Belmont, at Tonopah, the drift at the point of the strike made last week is in ledge matter a distance of 20 feet and the face is in ore running \$100 per ton, says the Miner.

A 60 H. P. steam hoist has been put in at the Golden Anchor mine, near Tonopah.

STOREY COUNTY.

An examination of the Forman shaft at Gold Hill from the surface shows that the damage to the timbering was not serious, only a few sets below the collar having been charred by the fire that destroyed the hoisting works. An inspection from the Suro tunnel south lateral branch showed the shaft in sound condition from that depth, no obstruction being visible from the tunnel floor to the surface. The castings of the hoist and pump plants are being broken up with powder to admit of removing the brass and copper bearings.

WASHOE COUNTY.

At the Silver Hill mine, near Reno, 270 tons of ore milled returned gold valued at \$4528 54. J. Kyle is superintendent.

NEW MEXICO.

GUADALUPE COUNTY.

The Missouri Oil & Asphaltum Co. are drilling for oil near Santa Rosa, with J. H. Chamberlain as superintendent.

SOCORRO COUNTY.

Operations will be resumed on the Graphic group of mines, near Magdalena, by C. T. Brown of Socorro and A. B. Flitch, who has had a lease on the Graphic mines for several years. A mill of at least fifty tons daily capacity will be built.

OREGON.

BAKER COUNTY.

(Special Correspondence).—E. W. Mueller, general manager of the Oregon S. & R. Co. of Sumpter, has leased the Baker City Sampling Works, and they will be operated by the Smelting Co. This places the Smelting Co. on a through line of transportation, and gives it the advantage of a depot and warehouse at the terminus of the Sumpter Valley Railroad, which reaches its property here. It also affords means of caring for consignments in less than carload lots, and affecting a settlement with the owner of the ores shipped to the smelter before they reach the destination. The plant is to be enlarged. The smelter is completed and will blow in as soon as the siding from the Sumpter Valley Railroad is completed.

R. J. Sorensen, president of the Highland Gold Mines Co., reports a rich ore shoot 3 feet wide, found 30 feet from the point where the Bannockburn crosscut opened the vein. In the drift on the shoot a medium-grade milling ore was passed through. This was darker than the high-grade stuff and showed more iron. The shoot is 3 feet wide, and as the work goes ahead is spreading across the drift. The 3 feet averages \$30 per ton.

Sumpter, Or., May 5.

A. Burch of Spokane, Wash., having a bond on the Independence mine, near the Magnolia, near Sumpter, has men at work and a contract for 400 feet of tunnel has been let.

E. S. Toppling, having a bond on the Forty-nine Jimmie, in Greenhorn district,

near Sumpter, says beaver pumps are being put in to handle the water, which was gaining on them.

A. J. Trimble, secretary of the Annalulu mine, in Cracker Creek district, near Sumpter, says operations will be started by June 1. The Annalulu group is on the Cracker Creek vein system, adjoining the Golconda.

The Auburn placers, 16 miles from Sumpter, on the Baker City road, owned and operated by the Auburn Deep M. Co., were started up last week. Men are at work putting in foundations for pumps, shaft house and hoist. The company has a shaft down 95 feet and is sinking for bedrock. It is thought the shaft may have to go down 200 feet.

The Golden Wizard Co., near Sumpter, will put in a 1000-gallon station pump on the 300-foot level, says Superintendent McPhee, and development work is being done, exploring the ore bodies and getting the mine ready for the mill, which it is expected will be built in the fall.

A. P. Jones, president and manager of the Lucky Boy G. M. Co., near Sumpter, has started operations. The Lucky Boy group is $\frac{1}{2}$ mile south of the Bonanza. Bonanza district, and includes five full claims, with plenty of timber near by.

A. G. Hanauer of Spokane, Wash., and Eastern associates have bought the Victor group, in Cracker Creek district, and development work is being done, with A. Geiser as superintendent. The Victor group represents five full claims. A tunnel will be run on the Cracker Oregon extension for 800 feet to tap the vein, and a shaft is being sunk. At a depth of 100 feet the ledge will be crosscut and the ore bodies explored. A compressor plant will be put in.

DOUGLAS COUNTY.

Manager F. Stull of the Red Bean mine, 16 miles from Glendale, says they are taking out free milling ore which runs \$20 per ton in gold.

JACKSON COUNTY.

The Eureka quartz mine, on Steamboat creek, one of the larger tributaries of the upper Applegate river, near Jacksonville, is being worked by G. S. & J. M. Bristol, A. Wakefield, W. H. Mowatt, J. L. Fenton and A. Ahlstrom of Ashland, owners. The vein is showing a width of 18 inches and assays \$100.

JOSEPHINE COUNTY.

J. G. Hayden is working his quartz mine on Galice creek, near Placer, and handling the ore in an arrastra, water power being used. The vein has an average width of 20 inches and runs \$20 per ton. The ore carries some sulphurets.

Superintendent C. D. Crane has seven men at work at the Lucky Queen mine, Jump-off-Joe district, near Merlin, being operated under a bond held by W. F. Harrington of Ashland. A tunnel has been run to connect with a winze of the old workings. Another tunnel is being run which will tap the ledge at a depth of 70 feet.

SOUTH DAKOTA.

CUSTER COUNTY.

It is reported negotiations are pending for the transfer of the Grand Junction mines near Custer.—The Black Hills Porcelain Clay & Marble Co. shipped another carload of mica to the Eastern market last week. Work is to be started this month on the lithographic stone and marble.—Many of the quartz miners have abandoned their lode mining and are working the placer diggings in several districts in this county, which can only be worked during the freshest season, owing to the absence of water at other times.

Ore carrying a high percentage of tungsten is reported found by W. H. Walling and T. Bowns in this county. The ore also carries some gold.

LAWRENCE COUNTY.

The mines of the Wasp No. 1 M. Co. of Yellow creek, south of Lead City, have been sold to Manager W. R. Dickinson of an Eastern company for \$40,000. Also, a bond is to be taken on the Wasp No. 2, the McShane group and several others, which in all will cover the principal part of the Yellow Creek district, the deal involving a total of \$850,000.

The Custer Peak M. Co., near Roubaix, have men at work at several points on their ground, the principal work being development in the Custer Peak shaft on the Wilson Merritt lode. A ledge of free milling and concentrating ore is being opened up, running \$3 per ton in gold.

The St. John's mine in Custer Peak district, near Roubaix, is being developed by J. Cusick & Co. under bond. They have a large body of free milling gold ore and intend to build a mill.

MEADE COUNTY.

C. H. Miller has a claim 3 miles northwest of Sturgis which contains a ledge with values in cobalt, says the Black Hills Mining Review. There are 140 acres, across which the ledge runs, but some of

the best matter seems to be on the Government reservation for Ft. Meade. The ore runs $3\frac{1}{2}\%$ cobalt, \$2.40 in gold and 60 cents in nickel per ton.

TENNESSEE.

KNOX COUNTY.

D. Baldwin of Cleveland, O., has bought 2000 acres of zinc lands and taken options on a number of other tracts in the zinc belt, near Knoxville. He says he has made arrangements for the erection of a smelter, work to begin this month. Associated with him are Connecticut men, H. C. Evans and W. Adams of Chattanooga, Tenn.

TEXAS.

EL PASO COUNTY.

The Federal smelter at El Paso is arranging to make additional improvements in the plant, work on which will begin by June 1. The capacity was doubled the past winter. The proposed addition, says President Jaycocks, will include a converting furnace, which will equip the plant for turning out copper pigs. The company has bought and leased several mines—some in Mexico. The company has 400 men at work at the smelter.

UTAH.

BEAVER COUNTY.

G. L. Brown, secretary of the Beaver G. & C. Co. of Salt Lake City, has been given an option on the Beacon mine in South Star district, near Milford, for \$35,000. Developments of the past three months include running a tunnel to intersect an incline in which they cut through 20 feet of copper sulphides, carrying $12\frac{1}{2}\%$ copper. In sinking a winze on this body of ore the foot wall was cut through and it proved to be but a casing of lime, beneath which is a body of lead carbonates, carrying 30% lead, says the Milford Times. Development work will continue in the winze and tunnel.

JUAB COUNTY.

The Uncle Sam Con. mine in Tintic district, near Eureka, will have a 50-ton concentrating plant, say President Dern and Manager Chipman. It is proposed to locate the mill at the mine. The mine has a body of low-grade ore which cannot be shipped at a profit.

A total of 137 carloads of ore were shipped from Tintic last week, the heaviest shippers being the Centennial-Eureka, Grand Central, Dragon Iron and Gemini mines. The United Sunbeam was added to the list. This makes a total of 643 cars shipped during April.

The shipment of a 33-ton lot of ore by the Little Chief contained 40% lead, 33 ounces silver and \$3 in gold.

The shaft on the Dagmar-Northwest mine is to be sunk to the 500 level and two shifts are at work, says Superintendent G. Adams.

The work of pumping out the South Swansea mine at Silver City is progressing satisfactorily. The water line is 80 feet below the 700 level.

SALT LAKE COUNTY.

The Sampson group of mines near Bingham, under bond to the Bingham Con. Co., is to increase its output to 100 tons daily.—It is understood the Highland Boy mine at Bingham will this month increase its shipments to 600 tons daily.

SUMMIT COUNTY.

The Daly-Judge mill at Park City is shut down pending the setting up of additional machinery which is expected to increase its capacity to 400 tons daily. The new machinery consists of a number of jigs and table concentrators, and a set of slime tanks. Development in the mine will go on as usual and the ore will be shipped to the American Smelting Co.'s plant in the valley.

TOOELE COUNTY.

Secretary Ellingwood says on account of the large flow of water in the Honerine tunnel at Stockton, headway is being made at the rate of only 3 feet per day, instead of 10 feet as formerly. The flow of water has as yet had no very noticeable effect at the Honerine mine, though the Bullion has been entirely drained and work in the mine resumed. At the Black Diamond, also, the water is lowering and development there can be taken up again. The drain tunnel will continue ahead.

The compressor plant at the Honerine tunnel, near Stockton, is in operation.

WASHINGTON.

OKANOGAN COUNTY.

In the Nespelem district, in the south half of the Colville reservation, J. P. Turner of Spokane says mining activity is increasing. The Apache mine shipped fifteen tons of ore last week, netting the owners \$10,000 in silver and gold. The Hilo, Double Header, Little Chief and a number of others are working. These mines are on the mountain above the Nes-

pelem river, near Nespelem, and near them are high falls, which furnish water power.

STEVENS COUNTY.

The supply of coke at the Northport smelter has been supplemented during the week, with the result that the furnaces are in operation. The plant has received a small quantity of Fernie coke, which has been in transit for some time, but no considerable supply from East Kootenay is yet in sight, so far as the Northport works are concerned, although the plants on the Canadian side are well supplied.

WYOMING.

LARAMIE COUNTY.

President J. A. Keblor of the Colorado Fuel & Iron Co. of Denver, Colo., says the company is preparing to build a \$300,000 railroad, a \$35,000 steel head-frame for the automatic handling of ore, an ore crusher and will open up their beds of iron ore near Sunrise. The steel head-frame is similar to those used in the iron regions of Michigan. A shaft will be sunk to reach the lower levels in the mines. The frame consists of an automatic loading arrangement which hoists the ore above the plant at the top of the shaft. The ore then passes down by gravity through the crusher and is loaded into cars automatically. The railroad, which will be 7 miles long, will run from Hartville to the Chicago mines, which are also to be opened and developed. Altogether it is expected the company will spend \$500,000 in developing that section to supply the increased demand for their plant at Pueblo, Colo.

FOREIGN.

BRITISH COLUMBIA.

(Special Correspondence).—The newly formed Provincial Mining Association, through its executive, have proposed certain amendments to the Placer Mining Act. The character of these amendments is rather to contract than to expand the provisions of the Mining Act. As a tax must be levied somewhere, and as it is proposed to remove the 2% tax from the mines, the prospector seems to be the individual that must in every case make up the shortage. The "one claim, one year" provision prevails in the proposed amendment. Every creek and placer claim is to be taxed 50 cents per acre. This tax must be paid before May 31 in each year. Five hundred dollars is the minimum of assessment work and \$2000 the maximum with \$5 per acre. Certain reservations for rights of way and drainage are made. On the whole, the proposed amendments are against the individual prospector and are in favor of companies and consolidation.

Victoria, B. C., May 4.

(Special Correspondence).—Mineral production up to 1900: The statistics show gold placers, \$62,584,443; gold, lode \$2,812,860; silver, \$13,649,809; lead, \$7,619,956; copper, \$1,362,583; coal and coke, \$49,140,917; building stone and structure materials, \$1,950,000; other material, \$34,640. Total for the province in all years, \$152,155,208. If to the above total of \$152,155,208, the production for 1901 and 1902 be added, the entire total will be found to approximate \$190,000,000 for British Columbia alone.

Victoria, May 4.

W. P. Pool has bonded the Homestake, Idaho and Detroit claims for \$100,000. They are near the Oyster-Criterlon and Eva mines, near Lardeau.

The Marble Bay mine at Texada, owned by the Tacoma Steel Co., is closed down for three weeks, while a more powerful hoisting plant is being put in. Meanwhile shipments from the dump, owned by J. J. Palmer, will continue.

K. Neitzel and O. J. Johnson of the St. Eugene Mountain mines, Ltd., near Fort Steele, are stripping the ledge on the Mountain Goat claim of the group and report favorable prospects.

It is announced that the Dominion Government will increase the bounty on lead ores.

The Fern mine, near Nelson, has again entered the shipping list, says Manager Rammelmeyer, and he intends to start up the mill this week.

The Wilcox mine at Ymir has resumed after a shut down of a few weeks, as supplies could not be gotten in over the accumulation of soft snow, which blocked the wagon road. The road is now passable for pack train.

The foundations were started last week for a slimes treatment plant at the smelter at Trail, says the Trail News. Silver slimes, similar to those produced in copper refining, are turned out in connection with the electrolytic refining of lead, and these were formerly shipped to the United States for treatment. They contain gold and silver, combined with arsenic, antimony and other impurities occurring in the lead bullion. When in operation, this

plant will turn out silver, gold, copper sulphate and either metallic antimony or antimonial lead.

One provision of the new Act for the amendment of the Coal Mines Regulation Act, introduced in the Provincial Parliament, which has passed its third reading, is as follows:

"Rule 34. No Chinaman or person unable to speak English shall be appointed to or shall occupy any position of trust or responsibility in or about a mine subject to this Act, whereby through his ignorance, carelessness or negligence, he might endanger the life or limb of any person employed in or about the mine, viz., as banksman, onsetter, signalman, brakesman, pointsman, furnaceman, engineer, or be employed below ground or at the windlass of a sinking pit."

CANADA.

ALBERTA.

A. E. Spriggs, associated with H. L. Frank, owner of the coal mines at Frank, wires the Butte, Mont., Inter Mountain that the rockslide destroyed a few cottages and some outside machinery at the mine entrance, the damage being overestimated. The fatalities number seventy, consisting of four miners, nineteen top laborers, twenty railroad laborers and twenty-seven women and children, who were in cottages. Everybody in the mine escaped uninjured and the mine workings are intact. Operations at the mine will be resumed as soon as the railroad gets in equipment.

KLONDIKE.

Dawson reports say that the Arizona Creek district—comprising Arizona, Hobo and Drapeau creeks—is coming to the front as a producer of placer gold. The territorial engineer brought out the information that pans as high as \$1 have been taken out, the average being 40 cents to the bucket. Arizona creek is 120 miles up the Klondike river from Dawson.

MEXICO.

CHIHUAHUA.

J. I. Long, manager of the Hidalgo M. Co., at Parral, denies the report that the Guggenheims had renewed negotiations for that company's mines, railroad and other interests in the Parral district. The Hidalgo Co. owns seventeen mines in the district, nine of which are in operation. In several of them the water is hard to handle. There are shipped from these mines 6000 tons per month.

Manager E. J. DeWitt is down 140 feet on the San Augustine mine, near Parral, and says he will sink to the 150-foot level, when he will crosscut, and drift on the vein. The ores average \$40 per ton in gold.

Increased activity is reported in Avonces Valles section, 18 miles south of Parral and 3 miles from Cuebas station, on the Mexican Central's extension to Rosario. The Maria mine is shipping regularly. The Mecatona M. Co. will start up next week on the Mecatona mine. J. P. Cruger is working the Los Remedios mine. The Santa Elena M. Co. has a group of three mines and has started work.

The Kansas City, Mexico & Orient R. R. Co., owning mines at Terrazas and Victorino camps, are doing development work.

Boyce & Burnham of Boston, Mass., have bought the Kruger mines at Cusihuirichic.

The Buenos Aires M. Co., W. C. Rollins manager, have completed a Huntington mill at Cusihuirichic, with pan-amalgamation equipment and settling tanks, which is expected to be in operation next week.

C. W. Clark of California has bought the Rosario mine at Guadalupe y Calvo, says F. L. Sizer, consulting engineer. The ore is low grade gold and silver, and the price paid is reported at \$500,000.

DURANGO.

The smelter at the iron mountain, El Cerro del Mercado, at Durango, is producing 22,000 pounds of iron daily.

The Penoles M. Co., near Mapimi, has three copper furnaces in steady operation.

The United Bufo M. Co. has been organized at Durango, and has leased the Armendia and La America mines on the east slope of the Mapimi mountains, and will put in development machinery and reduction works. A road is being built to the mine.

J. R. Lockhart, F. L. Norris and J. F. Frickler of Texas have bought a number of mines at Huahuapan, district of San Dimas, and have organized a company to operate them. It is claimed that one of the mines produces 500 ounces of silver and 3% lead per ton.

GUANAJUATO.

In the Juanita mine of the United States & Mexico M. & D. Co. at San Anton de las Minas, they are sinking a 500-foot vertical working shaft and are down 300

feet. The main pumping station will be on the 350-foot level.

GUERRERO.

Manager J. A. Carroll of the Mitchell Copper Co., operating at La Dicha, says the company propose to run a line of steamers between Acapulco and San Francisco to transport their output. They have 500 men at work around their mines. Hoisting and other machinery will be put in this summer.

NUEVO LEON.

The Monterey Iron & Steel Foundry Co. will build a railroad from Nuevo Laredo to their mines in the San Enrique coal fields near the Rio Grande river.

OAXACA.

The Taviohe M. & M. Co., near Ocotlan, report their mill nearly finished and expect to have it in operation by May 20. It is a concentration and amalgamation plant of 100 tons daily capacity. The ores carry gold and silver values.

SONORA.

The United States Graphite Co. of Saginaw, Mich., Z. T. Rawson, superintendent, has men at work on the Lapiz graphite mine near Minas Prietas. The ore is hauled to the railroad at Torres in wagons, and shipped to the United States for the manufacture of lubricants.

ZACATECAS.

The Nueva Quebradilla M. Co. of Zacatecas has a tunnel 580 meters long in which machine drills are used. These mines had been abandoned twenty-six years.

PERU.

M. J. Lidstone, constructing engineer of the Chiquistambo G. M., Ltd., says they have built a 40 stamp mill to be operated by water power. The ore values are principally in gold. A cyanide plant will be put up later on. The company's mines are 9 miles from Cerro de Pasco, in Junin department.

Books Received.

"The Improvement of Rivers," by B. F. Thomas and D. A. Watt, noted engineers. Under this title has been published a handsome volume of 356 + XIV quarto pages, with 92 full-page illustrations and folding plates. It is a treatise on the methods employed for improving streams for open navigation and for navigation by means of locks and dams. It is the first book on the subject published in the English language, and will prove of great interest and value to engineers everywhere. It deals with the construction of dams, locks, etc., in rivers and canals, of dredging and other methods of excavating, concrete construction, specifications, etc. In fact, the book is complete, and presents the practical experience of a large number of engineers who have undertaken and successfully carried to completion some of the world's greatest work of the character indicated. Cloth, \$6 net; postage 47 cents additional. John Wiley & Sons, New York; Chapman & Hall, London.

"Ancient and Modern Engineering and the Isthmian Canal" is the title of a volume of 473 pages, by W. H. Burr, C. E. It is profusely illustrated and is one of the most complete and thoroughly interesting treatises on the subject of engineering that has been published. The illustrations are half-tones from photographs of the subjects. It describes in detail all that is known of the ancient water systems of Chaldaea and Egypt; the pyramids, obelisks and temples; irrigation on the Nile; the noted ancient arches, etc.; noted structures in which cement and similar material were largely used, as the Appian Way, old Roman walls and arches, aqueducts, etc. A chapter is devoted to bridges, ancient and modern. Water works for cities is also given the space its importance deserves, together with the engineering features of works of this description. The Isthmian canal also receives marked attention, and the book throughout is most instructive and interesting. Price \$3.50 net, postage 27 cents additional. John Wiley & Sons, New York and London; Cunningham, Curtis & Welch, San Francisco, Cal.

Catalogues Received.

"The Excavation of Rock by Machinery" is the title of a pamphlet issued by the Sullivan Machinery Co. It describes their rock drills and paraphernalia, air compressors, receivers, etc., and gives much valuable information on this class of machinery. Office 135 Adams street, Chicago, Ill.

PERSONAL.

J. CULLEN of Butte, Mont., is in San Francisco, Cal.

DANA HARMON, of San Francisco, Cal., is in Utah examining mines.

A. B. DAVIS, of Seattle, Wash., is examining mines near Chloride, Ariz.

Z. KENDALL of Tonopah, Nev., is in San Francisco, Cal., on mining business.

DEW. CLARY of Stockton, Cal., is in San Francisco, Cal., on mining business.

J. S. MURRAY, interested in mines in Shasta county, Cal., is in San Francisco, Cal.

W. S. JORDAN, a mining man of Selma, Fresno county, Cal., is in San Francisco, Cal.

J. L. GRIMES is superintendent of the Barton mine, near Auburn, Placer county, Cal.

K. M. JACKSON, interested in mines in Nevada, is in San Francisco, Cal., on business.

C. M. MYRICK, a mining engineer of San Francisco, Cal., is visiting at Honolulu, H. I.

T. SPELLACY, interested in oil properties near Bakersfield, Cal., is in San Francisco, Cal.

W. B. CURRY AND A. J. KEYS returned last week to Beason, Illinois, from Prescott, Ariz.

M. S. BRADLEY AND E. R. WOODLE of Chicago, Ill., are in Butte, Mont., on mining business.

A. GARR is superintendent of the Bluejay mine (formerly Black Bird), near Winnemucca, Nev.

E. F. FRENDENTHAL, manager Manhattan mines, near Pioche, Nev., is in Salt Lake City, Utah.

J. POUNDSTONE is in San Francisco, Cal., on mining business from Grimes, Colusa county, Cal.

C. WALLER has returned to San Francisco, Cal., from an examination of mines in El Dorado county.

M. P. GILBERT of Tucson, Ariz., is examining a gold-copper property in western Gila county, Ariz.

PRESIDENT J. A. KEBLER of the Colorado Fuel & Iron Co. of Denver, Colo., is in Wyoming on business.

R. E. BORD, interested in mines near Shellville, Sonoma county, Cal., is in San Francisco, Cal., on business.

J. S. GOODWIN, interested in mines at You Bet, Nevada county, Cal., is in San Francisco, Cal., on business.

H. A. SUTTLE has returned to Peoria, Ill., from the mines of the Burlington G. M. Co., near Prescott, Ariz.

J. A. FLEMING, president Black Warrior C. Co. at Black Warrior, Gila county, Ariz., is in Philadelphia, Pa.

W. M. BROWN is mine engineer of the Bismarck-Nugget Gulch Con. M. Co., operating near Sheridan, Mont.

MANAGER G. H. ROBINSON of the Tintic M. & D. Co., Eureka, Utah, is in Butte, Mont., from Salt Lake City, Utah.

F. STULL, manager of the Red Bean mine, near Glendale, Douglas Co., Ore., is at Chloride, Ariz., examining mines.

M. E. JONES of Salt Lake City, Utah, is examining mining properties near Chloride, Kingman and Yuma, Ariz.

M. L. REQUA, president of the Pacific Steel & Wire Co., has returned to San Francisco, Cal., from Los Angeles, Cal.

C. BROWN is superintendent of the Crowned King mine, in the Bradshaw mountains, southeast of Prescott, Ariz.

J. HOOPER of Denver, Colo., has gone to Magdalena, Sonora, Mexico, to take charge of a gold proposition near there.

J. D. COPLIN, general manager Pacific M. & Metals Co., is in Kansas City, Mo., from Tucson, Ariz., on company business.

G. W. WOOD, president of the Flagstaff M. Co., of Ellsworth, is at their mines near Austin, Nev., from New York City.

PRESIDENT LEWIS AND MANAGER FARISH of the Majestic Copper Co. are in Denver, Colo., from Salt Lake City, Utah.

E. P. GILMAN of London, England, and A. Urquhart of Scotland are examining mines at Saltese, Missoula county, Mont.

P. W. FLEMING returned to Tucson, Ariz., last week from an examination of mines in Quijotea district, Pima county, Ariz.

G. R. DUNN of Binghamton, N. Y., interested in the Victor and Sterling mines near Prescott, Ariz., is visiting at the mines.

PRESIDENT DARLING of the Valenzuela M. Co., returned last week to Quartzsite, Ariz., from a trip to Los Angeles, Cal.

L. M. TEALE of Denver, Colo., is superintendent Treasure Hill M. Co. operating at Stockton Hill, near Cerbat, Mohave county, Ariz.

L. H. CARVER, E. M., has been appointed consulting engineer for the American Surface Electrical Railroad Co. of San Francisco, Cal.

J. A. CARROLL, manager of the Mitchell Copper Co., operating at La Dicha, Guerrero, Mexico, is in Chicago, Ill., on mining business.

SUPERINTENDENT R. T. PIERCE of the Crystal Lake G. M. Co. at Lupdy, Mono county, Cal., is in San Francisco, Cal., on business.

At the annual meeting of the Holthoff Machinery Co. of Cudahy, Wis., H. C. Holthoff was elected president and Isaac D. Adler vice-president.

H. D. SMITH, engineer for the Tomboy Gold Mines, Ltd., at Telluride, Colo., has returned to Denver, Colo., from a business trip to San Francisco, Cal.

MANAGER R. M. FOREE the Arizona-Colorado Copper Belt & G. M. & M. Co., operating at Globe, Ariz., is in Denver, Colo., on company business.

W. L. COBB AND W. Q. WRIGHT of San Francisco, Cal., are making an examination of mining property near Fort Jones, Siskiyou county, Cal.

A. D. WARNER of St. Paul, Minn., president of the St. Paul Oil Co., operating at Sunset, Kern Co., Cal., has returned from their oil properties.

A. G. HANAUER of Spokane, Wash., manager of the Victor mine in Cracker Creek district, near Sumpter, Or., is in New York on company business.

F. BLACKWELL of Calumet, Mich., is superintendent of the Northwestern Development Co. gold mines near Lardeau, B. C., vice H. Z. Brock, resigned.

MANAGER J. E. KERR of the Wisconsin and Paxton Oil Companies, operating at Half Moon Bay, San Mateo Co., Cal., is in the East on company business.

H. F. BEST of Savannah, Mo., president and manager Treasure Hill M. Co., operating at Stockton Hill, near Cerbat, Mohave county, Ariz., is at their mines.

J. A. FULLER AND C. D. HANCHETT of Hancock, Mich., have returned from an examination of the mines of the Arizona-Hancock C. Co., near Globe, Ariz.

WM. McFAUL, representing the Rand Drill Co. and the Davis Calyx Drill Co. of New York City, has established an office in the Rialto Building, San Francisco, Cal.

A. J. TRIMBLE, secretary and treasurer the Annalulu mine in Cracker Creek district, near Sumpter, Or., returned last week from a business trip to Chicago, Ill.

D. E. BIGELOW is manager of the Lake View Consols, Ltd., mines at Boulder, West Australia, vice W. A. Pritchard, who is with Bewick, Moreing & Co., Kalgoorlie.

H. A. CLAPP, of Denver, Colo., manager of the Sonora M. Co. of Sonora, Mex., returned to Denver, Colo., last week from an extended trip through Mexico.

R. WALKER, for several years superintendent of the Gold Hill mine, near Grass Valley, Cal., is underground superintendent of the North Star M. Co. in the same district.

SUPERINTENDENT E. E. PARTZ of the Goldwin mine, near Carters, Tuolumne county, Cal., left San Francisco, Cal., for Central America this week on mining business.

R. BLEI, of New York, interested in copper properties near Valdez, Alaska, returned this week from Valdez, and has gone to Cornwall, England, on mining business.

E. F. STAPLES of Baverstock & Staples, assayers of Los Angeles, Cal., has gone to Sonora, Mexico, to close a sale of property in which they are interested, to an English company.

J. L. GLUYAS, for a number of years foreman of the North Star mine near Grass Valley, Cal., is foreman of the Gold Tunnel M. Co., operating near Nevada City, Cal.

T. HOOPER, superintendent Victoria mine, near Mass City, Ontonagon county, Mich., has returned from a trip to Globe, Ariz., in connection with the Arizona-Hancock C. Co.

J. J. MARTIN, manager of a group of mines at Remedios, Colombia, South America, is visiting Grass Valley, Cal., and will go to Colorado before returning to South America.

W. S. GAGE, consulting engineer for G. Mitchell & Co. of Cornwall, England, returned last week to Tacoma, Wash., from Valdez, Alaska, on mining business, and has gone to England.

R. D. GEORGE, Ph.D., Professor of Geology and Petrology, University of Iowa, has been appointed to and accepted

a similar position with the University of Colorado, at Boulder, Colo.

A. B. KNIGHT, formerly professor of civil engineering in the Montana School of Mines, is consulting engineer of the Bismarck-Nugget-Gulch Con. M. Co., operating near Sheridan, Mont.

J. KNOX of Houghton, Mich., former assistant superintendent of the Trimountain mine, is superintendent of the Eva group, owned by the Calumet & British Columbia G. M. Co., near Lardeau, B. C.

R. J. DAVISON, of Bath, New York, president of the Oregon Mines Exploration Co., operating the Snow Creek mine, near Sumpter, Or., and C. M. Brown, of Denver, Colo., are in Sumpter, Or.

WALLACE MACGREGOR, E. M., of Berkeley, Cal., has returned to his home from Costa Rica, C. A., where he has been for some months erecting milling plants on the mines of Abangarez Gold Fields, Ltd., of New York.

HENRY B. KAEDING, E. M., of San Francisco, is in Shasta Co., Cal., examining the property of the May Blossom Copper Smelting Co., together with other mines in the vicinity of Redding, for intending purchasers.

V. A. THORNE of Salt Lake City, Utah, manager of the Daily group of claims in Gambrinus district, near Boise, Idaho, will leave next week for England to confer with the owners of the property in regard to further developments.

M. J. LIDSTONE, constructing engineer, has returned to San Francisco, Cal., from the mines of the Chiquistambo G. M. Co., Ltd., near Cerro de Pasco, Peru, where he has been building a 40-stamp mill for the Union Iron Works of San Francisco, Cal.

W. E. DEFTY, who was injured by falling down a winze in the Las Planchas de Plata mine several weeks ago, is in the field again. He has gone to the Arizpe and Altar districts in Sonora, Mexico, and will go from there to the State of Michoacan.

JAMES McEVOY, consulting geologist Crow's Nest Pass Coal Co. of British Columbia, and for a number of years on the staff of the Dominion Geological Survey, was in Victoria, B. C., May 1. On receipt of news of the Frank disaster, he proceeded to Frank and from there went to Toronto, the headquarters of his company.

Commercial Paragraphs.

THE Allis-Chalmers Co., Chicago, Ill., announce that after May 1, 1903, the general offices of the company will be located in the New York Life Building, fourteenth floor, corner of La Salle and Monroe Sts.

THE Brown Corliss Engine Co. of Corliss, Wis., report receiving an order from the Pfister & Vogel-Leather Co. of Milwaukee, Wis., for a 28x48-inch heavy duty Corliss engine, also an order from F. R. Payne of Williams, Iowa, for a 12x30-inch Corliss engine.

JOHN A. YEATMAN & Co. of San Francisco, Cal., hydraulic engineers and contractors, report shipping last week for the Northern Light M. Co. at Gollivan Bay, Alaska, a complete hydraulic equipment, including an Adams hydraulic lift, pipes, gates, flanges, raffles, ore cars and track.

J. H. ADAMS, San Francisco, Cal., inventor of the Adams hydraulic lift, reports shipping the past week five hydraulic lifts by Schooner Lettitia for Ophir creek, Council City district, near Nome, Alaska; also one for the N. A. T. & T. Co., Nome, and one for the same company to Miller creek, Forty Mile district, Yukon Territory.

THE Webster, Camp & Lane Co. of Akron, O., has consolidated its interests with those of the Welman-Seaver-Morgan Engineering Co. of Cleveland, O., and the two establishments will hereafter be conducted under the name of the Welman-Seaver-Morgan Co. The plans of the new organization, while continuing the manufacture of all lines heretofore carried on by the consolidated companies, embrace the extension of the various departments and the taking over of new and large engineering projects.

THE Gutta Percha Rubber Co. of New York have removed their Pacific coast offices and sales department to larger and more commodious quarters at 26-28 Fremont St., San Francisco, Cal., made necessary by the expansion of their business during the past year. The additional space thus obtained has allowed of a more systematic and convenient arrangement of the stock, which consists of belting, packing, tubing, hose and suction hose, dredger sleeves for pontoons, concentrator

belts, etc. There are fifty tons of belts of all sizes on the main floor, and in the basement are racks for carrying tubing and suction hose up to 12 inches in diameter in 50-foot lengths. A. C. Bates is manager.

OWING to the necessity of obtaining more room, Robert W. Hunt & Co. have moved their New York office to No. 66 Broadway. Messrs. J. J. Cone and J. C. Hallsted of the firm sailed for Europe on the 2nd inst., the former returning abroad after a few weeks visit home. Mr. Hallsted has gone to give personal supervision to the inspection of the structural material for two large London hotels, which has been awarded his firm. These contracts, with several others for buildings to be erected in England and South Africa, as well as the bridge material for this continent, has compelled the firm to organize a foreign structural and bridge department, in addition to the one in charge of rails, splice bars, billets, etc.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING APRIL 28, 1903.

726,302.—MOWERS—T. O. Bailey, Nellie, Cal.
726,493.—CEMENT AND GRAVEL SEPARATOR—J. Behm, S. F.
726,635.—WELL TUBE PERFORATOR—J. J. Brinkman, Bakersfield, Cal.
726,639.—JAR CLOSURE—W. E. Brown, Los Angeles, Cal.
726,402.—BOTTLE—Laura A. Calhoun, Los Angeles, Cal.
726,641.—CLOTHES DRIER—G. Church, Milton, Or.
726,255.—DRILL BIT—Clark & Currier, S. F.
726,634.—ENGINE GOVERNOR—P. V. Cornils, Seattle, Wash.
726,512.—RAILWAY SIGNAL—E. M. Cutting, Oakland, Cal.
726,659.—GATE—A. C. Hunt, Napa, Ariz.
726,657.—ILLUMINATING TILE—P. H. Jackson, S. F.
726,639.—CUSPIDOR CARRIER—J. P. Johnson, Sonoma, Cal.
726,716.—BRUSH—D. F. Maher, Watsonville, Cal.
726,741.—LOCK—J. M. Owen, Ukiah, Cal.
726,834.—BOLTER—R. M. G. Phillips, Los Angeles, Cal.
726,756.—FRUIT GRADER—C. Rayburn, Visalia, Cal.
726,827.—WASHING MACHINE—G. H. Rhodes, Healdsburg, Cal.
726,853.—ROTARY ENGINE—P. C. Sainsevain, San Jose, Cal.
726,700.—GRAVE PROTECTOR—F. Skienke, S. F.
726,867.—RAILWAY GATE SIGNAL—Stevens & Terhorg, Modesto, Cal.
726,781.—KEY RING—N. B. Stone, Outlook, Wash.
726,732.—WIRE—N. B. Stone, Outlook, Wash.
726,807.—SEALING JARS—W. Walter, Shelton, Wash.
726,597.—TICKET PUNCH—H. C. Watson, Oakland, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

CEMENT AND GRAVEL SEPARATOR—No. 726,493. April 28, 1903. J. Behm, San Francisco, Cal. The object of this invention is to separate the gold-bearing cement from the gravel or rock by attrition and at the same time reduce the material to such a degree of fineness that it can at once be put through the usual processes for saving gold which is mixed with sand or tailings. It is adapted to carry on the work on a large scale and in an economical manner. Mr. Behm, the inventor of the above ingenious device, is a practical mill builder and had charge of the foundation, concrete and frame construction of the 100-stamp mill now nearly completed at Hodson, Cal., for the Royal Con. G. M. Co.

RAILWAY SIGNALING DEVICE.—No. 726,512. April 28, 1903. E. M. Cutting, Oakland, Cal. One-half assigned to W. W. Slater, San Francisco, Cal., and H. C. Barnes, Oakland, Cal. This invention relates to improvements in signals for use upon railways and for like purposes and means for operating such signals. It comprises a railway signal consisting of two stationary and differentially colored semidisks having a substantially continuous periphery, a central circular opening, one-half of which is formed in each disk, glasses fixed in each half having a color corresponding in significance with the segment in which it is fixed, and blinds with means by which they are movable in unison to conceal and expose the other glass and a light fixed behind the glasses.

ILLUMINATING TILES.—No. 726,537. April 28, 1903. P. H. Jackson, San Francisco, Cal. This invention relates to illuminating floor, roof or sidewalk tiles, such as are made of glass or transparent material; and it consists in the novel form of such tiles, whereby the light is reflected, refracted and diffused within the space beneath the surface and the light is set. The invention is particularly designed to so direct the light passing through each tile that it will be thrown beyond the lower edge of the tile preceding it in the direction in which the light is to be transmitted.

CUSPIDOR COLLECTOR AND CARRIER.—No. 726,539. April 28, 1903. J. P. Johnson, Sonoma, Cal. This invention relates to a device for carrying cuspidors or vessels of any description where it is desirable to carry a number at once. It consists of a frame of suitably sized material to receive the articles to be carried, a slidable yoke guided and movable with relation to the vertical portion of the frame, and jointed links or equivalent devices which are adapted to fold inward by gravitation, so as to form supports for the articles to be carried. These links are raised into a straight line by lifting the yoke, and when the yoke is released they fold inward, so as to engage the bottom or other part of the device to be carried and hold it in place.

TICKET PUNCH ATTACHMENT.—No. 726,597. April 28, 1903. H. O. Watson, Oakland, Cal. This

invention consists in the combination in a ticket or like punch of fulcrumed handles, a punch-carrying lever pivoted between said handles, a curved single leaf spring having one end fixed to one of the handles and the opposite end contiguous to the rear end of the punch lever, channels made in the adjacent surfaces of the lever and spring, and a ball resting and revolvable in said channels.

Latest Market Reports.

SAN FRANCISCO, May 8, 1903.

METALS.

SILVER.—Per oz., Troy: London, 25d (standard ounce, 925 fine); New York, per silver 54½c, refined (1000 fine): San Francisco, 54½c; Mexican dollars, 42 @ 42½c San Francisco, 41½c New York.

Since last week's quotations, silver has made a further advance of ½ cent per ounce. The mints will require a large amount of silver monthly, and this will not only have the effect of sustaining the present price, but will probably advance it still higher.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50 @ 14.75; Electrolytic, 1 to 3 casks, \$14.50 @ 14.75; Casting, 1 to 3 casks, \$14.50 @ 14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £61 7s 6d spot per ton.

The copper market shows little material change from last week's quotations. An authority says the copper outlook for 1903-4 is good, as the large electric installations demand such a large amount of the metal that the demand and price will be maintained at or near present market figures.

LEAD.—New York, \$4.37½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £12 1s 3d per long ton—2.75c per lb.

SPELTER.—New York, \$5.75; St. Louis, \$4.60; London, £21 15s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 100-lb lots, 10c; 300 to 500 lbs., 11c; 100-lb lots, 13 @ 15c.

TIN.—New York, pig, \$29.90 @ 30.10; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33c; bar tin, \$35 @ 37½c. London, £136 spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19.00; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots: London, £8 15s; San Francisco, local, \$45.00 @ 46.00 of 70½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 31c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17.15c.

NICKEL.—New York, 50 @ 60c @ 7c; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$22.35; gray forge, \$20.50; San Francisco, bar, 3c @ 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$30.00; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$22.50 @ 23.00
Foundry Northern 1.....	22.50 @ 23.00
Northern 2.....	22.00 @ 23.50
Northern 3.....	21.50 @ 22.00
Southern 1.....	21.35 @ 22.35
Southern 2.....	20.85 @ 21.85
Southern 3.....	20.35 @ 21.35
Forge.....	19.85 @ 20.85
Charcoal.....	26.00 @ 27.00
Billets, Bessemer.....	33.00 @ 34.00
Bars, iron.....	1.85 @ 1.90
Bars, steel.....	1.75 @ 1.80
Rails, standard.....	28.00 @ 30.00
Rails, light.....	34.00 @ 40.00
Plates, holler.....	1.90 @ 2.00
Tank.....	1.75 @ 1.90
Sheets, 26 store.....	2.90 @ 3.00
No. 27.....	3.00 @ 3.10
No. 28.....	3.10 @ 3.20
Angles.....	1.75 @ —
Beams.....	1.75 @ —
Tees.....	1.80 @ —
Zees.....	1.75 @ —
Channels.....	1.75 @ —
Steel melting scrap.....	18.50 @ 19.00
No. 1 railroad wrought.....	20.50 @ 21.50
No. 1 cast, net ton.....	17.50 @ 18.50
Iron rails.....	24.50 @ 24.50
Car wheels.....	24.00 @ 24.50
Cast borings.....	9.50 @ 10.50
Turnings.....	14.50 @ 15.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher;

redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.25; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. O. H. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1½, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1½ 60%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2½ 35%, carload lots, 9½c; less than one ton, 11½c. No. 2½ 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

OILS.—Linseed, boiled, hbl., 56c; cs., 61c; raw, hbl., 54c; cs., 59c; Lucol oil, hbl., 50c; cs., 55c; raw, hbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 22½c; Astral, 22½c; Star, 22½c; Extra Star, 25½c; Eocene, 24c; Elaine, 27½c; Water White, in bulk, 16c; Mineral Seal, iron hbls., 18½c; wooden hbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, hulk, 17c; do., cs., 23½c; 86° Gasoline, hulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., hbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, hbl., 75c; cs., 80c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50 @ 55c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brynho, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

CHEMICALS.—Cyanide of potassium, 98½-99%, johhing, 25 @ 26c @ lb.; carloads, 23 @ 24c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 24 @ 25c @ lb.; caustic soda, in drums, 3 @ 4c @ lb.; Cal. s. soda, hbls., \$1.25 @ 1.50 @ 100 lbs.; sks., \$1.05; chloride of potash, 12 @ 13c; nitrate of potash, hbls., 10c; caustic potash, 10c in 40-lb tins; horax concentrated, 7 @ 8c @ lb.; roll sulphur, 4 @ 6c; powdered sulphur, 2 @ 3c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5 @ 7c; chloride of lime, spot, \$2.50 @ 2.75; sulphuric acid, in carboys, 66½ B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ¾c per lb. above kegs price; in 1 and 5 lb. tin cans, 100 lbs. per case, ¾c per lb. above kegs price. Dry Lead.—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb. powdered, 9 @ 12c; fused, 25 @ 30c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—Pure, 7 @ 10c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

BISMUTH.—Sulphate, per lb., \$1.60.

SODIUM.—Metal, 7 @ 10c.

MERCURY.—Bichloride, 7 @ 9c.

PHOSPHORUS.—(American) per lb., 75c.

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Searchlight District, Nevada.

One of the mining districts of the Great Basin region to attract attention the past few years is Searchlight, in the southeast corner of the State of Nevada. The district is near the Colorado river and also near the California State line. It is in the line of the mineral belt extending northwesterly through western Arizona from Stockton Hill, Mineral Park, Chloride and Gold Roads. This mineral belt is wide and comprises mines of gold, silver, copper, lead and iron. It has already produced millions of dollars in precious metals and is destined to produce many millions more. The Gold Roads camp is near the Colorado river, on the Arizona side. One of the accompanying illustrations is that of the Gold Roads camp



Good Hope Mine, Searchlight, Nevada

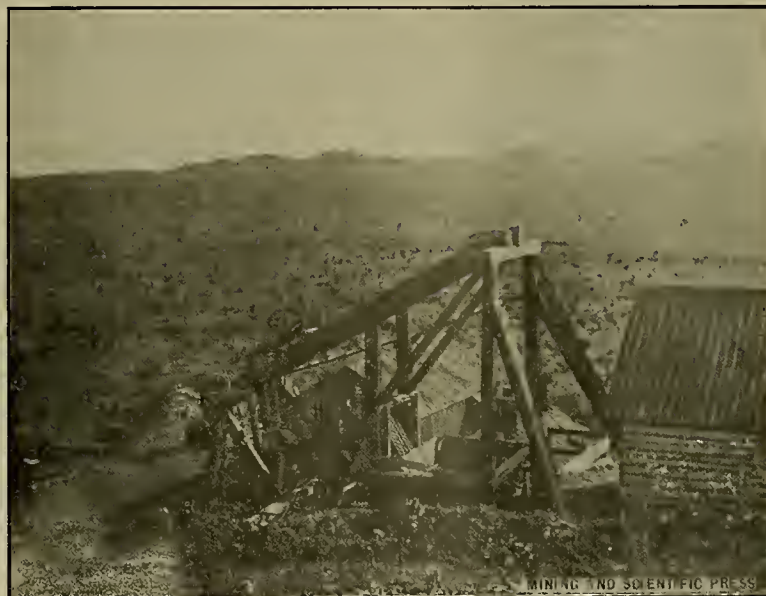
in depth. At Gold Roads the veins are fissures filled with quartz and spar, with gold values.

At Searchlight the Quartette, Searchlight, Rambler and Good Hope are among the important properties. The formation in which the veins occur is porphyry. The hills are low and rolling. The local mineral belt is about one-half mile wide. The Quartette Co. built its first mill on the Colorado river, 15 miles distant, and then built a narrow gauge railroad, 17 miles in length, connecting mine and mill. Since that date water has been developed at the mine and a second mill built at the mine.

Three of the accompanying illustrations are of head-frames on the respective mines of the camp. That at the Good Hope is not unusual and its duplicate may be seen almost anywhere, but the frames on the Rambler and Search-



Novel Dumping Device, Searchlight Mine, Searchlight, Nevada.



Rambler Mine, Searchlight, Nevada.

and mine. The Gold Roads mines were discovered but a few years ago and have attracted attention by reason of their extent and value. This section of Arizona, though in a desert, miles from available running water, has nevertheless produced ores of such a grade that each of the several camps has been enabled to establish itself without the aid of outside capital, some of the ores being of shipping grade. The more extensive and deeper development of the mines has resulted in the building of concentrating and other mills in these districts, and the placing of the industry on a more substantial basis. Most of the mines in depth have found water in their lower levels, and this has simplified the economic problem somewhat. Although some of these districts in northwestern Arizona have been known and worked for years, the frequent report of new strikes shows that the full extent and value of the mineral belt has not been fully determined as yet. The veins occur in old crystalline rocks, some of them metamorphic, others igneous, and the variety of ore covers almost everything in the way of sulphides, the principal ores being pyrite, galena,



Gold Roads Mine, Mojave County, Arizona.

zinc blende and chalcopryrite. Ruby silver and native silver are common in the ores of Stockton Hill, Cerbat and Mineral Park. The ores at the surface at Chloride are, as the name indicates, chloride of silver, sulphides coming in

light mines are unique and of a type rarely, if ever, seen elsewhere. The hoisting engine raises the bucket from the shaft, the rope passing over the sheave wheel which runs on an inclined track. When the bucket reaches the sheave the engineer continues to hoist slowly and the bucket is carried up the inclined plane, as shown in the illustrations. The method of dumping is shown in the picture of the Searchlight frame. Beneath the bucket is a short chain or rope with a block of wood attached. The rope slips into a notch cut in a heavy plank secured to the frame. The block beneath prevents the bucket from going beyond the length of short rope. The engineer slacks and the bucket is dumped into the bin as shown, when it is again hoisted and allowed to run back with the sheave to a point over the shaft, from which it descends into the mine. The engineer does all the top work—that is, runs the engine, trams two cars to dump or ore bin, and does the blacksmith work as well. The above described device is doubtless satisfactory, but does not seem to be the most simple that may be devised to accomplish the same result.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Good Hope Mine, Searchlight, Nevada.....	312
Novel Dumping Device, Searchlight Mine, Searchlight, Nev.....	312
Ramhler Mine, Searchlight, Nevada.....	312
Gold Roads Mine, Mojave County, Arizona.....	312
McLaughlin Steam Tractor.....	318
Mining and Metallurgical Patents.....	320
EDITORIAL:	
Searchlight District, Nevada.....	312
Contributing Technical Articles of Merit.....	313
Value of United States Geological Survey.....	313
Leadville and Its History.....	313
Make Haste Slowly.....	313
MINING SUMMARY	321-322-323-324-325
LATEST MARKET REPORTS	326
MISCELLANEOUS:	
Concentrates.....	314
Mineral Resources of Southeastern Alaska.....	315
Use of Metal Tamping Bars.....	315
Cyaniding Tailings in Sierra Co., Cal.....	315
Separation of Gold From Copper.....	316
Continuance of Strikes.....	316
The Making of an Oil Well Bit.....	316
Radium.....	317
Assaying Cyanide Solutions.....	317
Deposition of Ores in Limestone.....	317
A Steam Traction Engine.....	318
Leveling by the United States Geological Survey.....	318
Silver Mining and Smelting in Mongolia.....	318
The Randsburg Mining Section Mapped.....	318
Ore Treatment at Mt. Lyell.....	319
The American Negro for the Rand.....	319
A Word of Warning.....	319
Mining and Metallurgical Patents.....	320
Personal.....	325
Catalogues Received.....	326
Commercial Paragraphs.....	326
Obituary.....	326
Books Received.....	326
New Patents.....	326
Notices of Recent Patents.....	326

It pays (in a variety of ways) to contribute articles of technical merit to the MINING AND SCIENTIFIC PRESS. Some months ago the owners of a big metallurgical establishment wanted a competent manager and wrote this office for the present address of a man who had furnished detailed illustrated account of a similar work in which he had been successfully engaged. Recently a South American mining company secured a manager in a similar way. Beyond and above such cases, which might be numerous cited, it may be said that the best things in this life are not paid for in money, and there is a high appreciation of this in the numberless cases where mining or metallurgical skill is recounted by its possessors in these columns to the common good and real enrichment of their fellow workers everywhere who read. That such things are greatly appreciated and are of permanent value, is exemplified by the fact that it is a daily occurrence in this office to receive personally or by mail inquiry as to the details of some problem in mining, or metallurgy, or engineering, that was described or illustrated herein, with a view to present application to the work in hand.

THE value of the excellent work done by the United States Geological Survey in the Cripple Creek, Colo., district in 1893-94 was fully appreciated by the mining men of that district, and the recent steps taken to secure the necessary funds to bring the work of the Survey up to date, shows this to be so. Since the original survey a vast amount of development has been done, and it has been generally conceded that a re-survey was not only desirable, but would be likely to prove of great value. The survey was about half completed when the funds available for it were exhausted. To meet this shortage those interested have contributed liberally, and the survey will be complete. It is thought that a resurvey will be of great value, as the extensive development of the mines will permit clearer insight into the geology of the district.

Leadville and Its History.

Among the noted mining camps of the world is Leadville, Colo., situated on the west slope of the Mosquito range, at an altitude of over 10,000 feet above the sea. The rush of 1859 to Pike's Peak resulted in bringing into Colorado a horde of hardy and venturesome spirits, who quickly spread through the mountains of the eastern range of the Rocky mountains. Thousands were doomed to disappointment, but many were rewarded by the discovery of gold and other valuable minerals, and yet in that mad rush much that was valuable was overlooked and laid for years neglected. This was to have been expected, of course, for about all that was known of mining in 1859 was the experience gained in the mines of California. Gold was discovered on Tarryall creek, at the head of South Park, in 1859, and early in the spring of 1860 a few prospectors penetrated further and discovered gold on California gulch, a tributary of the Arkansas river, and a town quickly sprang into existence and was known as Oro City. It is said in the height of its prosperity that there were 10,000 people in the town, but this is probably exaggerated. Within a year or two the placers were practically exhausted, producing, it is variously estimated, from \$3,000,000 to \$10,000,000. The placer miners had much difficulty with a heavy gray sand that filled the riffles of their sluices and caused the gold to wash over and run out into the tail race. For a long time the nature of the mineral was unsuspected, but it eventually became known that the troublesome gray sand was lead carbonate. This discovery was made in 1874, but prior to this a search for the source of the placer gold resulted in the discovery and location of the Printer Boy, Twenty-five and some other mines in the porphyry belt. Since then and in recent years many other mines of similar character have been developed and are to-day large producers. Among these are the Ibez and Resurrection groups. The lead-silver ores were really not discovered until 1874, and in 1875 numerous locations were made on Iron hill. In 1876 the first lot of carbonate ore was shipped to a St. Louis, Mo., smelter, but active prospecting did not begin over the district until 1877, when many locations were made. This was nearly twenty years after the original discovery of gold in California gulch. A new town grew up and was called Agassiz. It consisted of log cabins along California gulch on the site of the old town of Oro. The population numbered 200. The only communication with the outside world was by wagons and stages. Three years later, in 1880, the place had grown to 15,000 inhabitants, with a large floating population, and was supplied with all the necessities and many of the luxuries of modern metropolitan cities. Large smelting works were in full blast, and the annual output was about \$15,000,000, which later grew to \$18,000,000.

Later the fall in the price of silver and of lead, the deepening of the mines and resulting heavy volumes of water, and the change from carbonate to sulphide ores of complex type, resulted in reducing the output materially, but Leadville has always been a progressive camp, and the economies introduced and practiced there have been followed all over the world. The metallurgists of Leadville introduced many innovations in smelting, overthrowing old, time-honored ideas, and proving that old methods were not always the best methods: that the high percentage of lead employed in smelting was not essential to success. The furnaces were changed in shape and size, until the old-fashioned stacks looked like experimental plants by the side of the giant cupolas built for the reduction of Leadville's ores. The successful development of Leadville's mineral resources did much to give to Colorado the prestige that State enjoys as a mineral region. There are mines all over the State, but Leadville showed what was possible in a rugged, mountainous region two miles above the sea. The energy of her miners defied and surmounted all obstacles, and set the pace for the world.

The history of Leadville district, extending over a period of forty-three years, is peculiar, and illustrates in the most interesting manner the growth of knowledge of mining and metallurgical practice, and its evolution from methods sufficient in their day, but now obsolete and looked upon as crude and out of date, is instructive as well as interesting. Indeed,

the methods of 1859 could not endure in this age of active competition. A large part of the values of Leadville's production is in base metals—lead, zinc and copper, with gold and silver in much less amount.

Should the gold of California gulch be first discovered to day, within two years Leadville would have gone through much of her entire past history. The carbonate ores would have been discovered within a few days and railroads, smelters and all that now goes to make up its modern equipment would have been accomplished. Cripple Creek, a comparatively modern discovery, is evidence of this. The discovery of any new district possessing such vast latent mineral resources as the districts of Leadville and Cripple Creek will, with the aid which present knowledge gives, quickly reach the zenith of its prosperity.

The monthly output of Leadville is about 75,000 tons of ore, and that this can be maintained for a long period seems probable. Its future depends almost wholly upon the development and treatment of its large bodies of low-grade sulphide ores, of which there is stated to be many millions of tons available. The zinc in the sulphide zone has had a retarding effect on the industry until lately, but the introduction of the electro-magnetic separator means much for this district, as by its use two clean products are now possible, the zinc ores on one side and the lead-iron ores on the other, both products containing gold and silver.

The principal drawback to the greater development of Leadville's resources is water in the deep mines, and the unfortunate phase of that is that unless concerted effort is constantly made to handle the water problem further extensive development must be comparatively slow. Still, the mines have thus far shown their ability to handle the water encountered, and the decreasing cost of power which may be anticipated will be a factor of no small importance in the economy of Leadville's further development.

Make Haste Slowly.

Mining companies are organized for profit, which is a legitimate and a much-to-be-desired result of mining operations, but haste to pay dividends is sometimes retro-active, and works more harm than good. When a mine is acquired, by purchase or otherwise, if it is not already equipped it must be provided with the necessary machinery, buildings, etc. Then, if the mine is in sufficiently advanced condition to afford a continuous supply of payable ore, dividends may be considered, but the unfortunate experience of many companies which have prematurely declared dividends—that is, disbursed the first available profits in dividends, making no provision for a possible change in existing conditions—has shown the wisdom of withholding a sum sufficient to rebuild the surface plant or to tide over any temporary and unforeseen interruption in the progress of mining and reduction of the ores. The wisest companies create a sinking fund, employing a stated percentage of profits, or setting aside a monthly sum for the purpose. Deterioration is one of the things that must be given consideration, and possible extension or change in the character of the plant are even more important considerations. Stockholders are always willing to accept dividends, and in the majority of instances it is their wish that dividends be forthcoming soon and often, but there are few stockholders who cheerfully submit to an assessment even when they realize that the money is to be used in extending the plant to the ultimate advantage of the stockholders themselves. Many a competent superintendent is embarrassed and handicapped by the demands of the directors and stockholders of his company for dividends. In one instance, an important and absolutely necessary improvement—the sinking of a new shaft—was delayed and the project was finally abandoned after having been started for the reason that the company demanded that certain profits be distributed in dividends, and later when the mine ceased paying because of the great expense of operating through the crooked old shafts, the stockholders refused or were unable to "put up" the money necessary to sink the new shaft, and the mine was closed down and remains closed, but this is only one instance of many of the same kind.

CONCENTRATES.

NORMAL CYANIC ACID is unknown in the free state, but there are ethers of it, as, for example, methyl cyanate.

DACITE is a quartz-andesite, with the quartz occurring either in sharply outlined crystals, or more or less rounded or corroded, with inlets of the ground mass.

THERE is no local market for large quantities of mica on the Pacific coast. Buyers of mica are A. Schoonmacker, E. Munsell and Union Mica Co. of New York City.

WHEN ter-chloride of gold is immersed in caustic ammonia it forms a compound which explodes when struck. It is a dangerous and extremely unstable substance.

THE steel wires in flat cables usually will outlast several "sewings" of the soft iron wire used in their construction, the latter wearing much more rapidly than the vertical wires.

RETORTING quicksilver will extract the grease. It were better to retort the last tenth of the fouled quicksilver separately from the first nine-tenths. The heavy portion, or residuum, will be with the last tenth.

IN the "nail assay" of sulphides, a convenient way of introducing the iron is in the form of cut tacks—8 to 12 of No. 8's, according to the character of the sulphides—scattered on top of the charge in the crucible after mixing.

WITH increasing altitude the boiling point of water becomes lower, until at great altitude the hand may be immersed in boiling water without injury or discomfort. Altitude is often estimated by use of "boiling point" thermometers.

HEAVY stamps should be provided with proportionally heavy mortars, and require more power than light ones. The heavy stamps will crush relatively more rock than light ones, but the limit in weight to which gravity stamps have been carried is about 1200 pounds, when newly shod.

ANTIMONY is found in the native state in several localities in California. It occurs in a number of minerals, the most common being stibnite, Sb_2S_3 , which is the principal source of the antimony of commerce. It is a brittle mineral, and pulverizes easily. It melts at 425°F . and vaporizes at a red heat.

It has been stated that the appearance of native mercury in quicksilver mines may usually be considered an indication that the bottom of the ore shoot or deposit is being reached. That this is absolutely a fact has not been fully demonstrated, though indications point to the probability of the statement being true.

SO FAR as "Concentrates" knows there is no one at present treating antimony ore on the Pacific coast. The fact that the antimony ore specified carries good value in gold would not make it a valuable smelting proposition, as in the extraction process much of the gold is not ordinarily susceptible of being saved.

ALL stamp batteries should be so arranged as to be operated singly, that is, independent of adjoining batteries. This may be accomplished by providing separate cam shaft and pulley for each mortar with its complement of stamps, or by a series of clutches on the several pulleys leading from the mill line shaft to the cam shafts.

AS these "Concentrates" are answers to questions, the questions themselves being omitted, and the reply boiled down in briefest space, it is desired that such inquiries be stated as clearly and accurately as possible, so that the reply may be of value not only to the inquirer, but to many other readers who may wish the same precise information.

ANGLESITE is sulphate of lead. It is not an abundant mineral, but occurs with other lead minerals as a secondary product of the alteration of galena. Masses of anglesite, when not pure, often show the remains of the cubic structure of the original crystals of galena and sometimes, at the nucleus, solid crystals of unaltered galena may be seen.

A CERTAIN type of vein is observed sometimes in granite which at the surface is well defined and often rich in gold, but which pinches out in shallow depth. These are often called "gash" veins. That such veins do not open out below with improved values is not demonstrated in most cases, as with the first pinch all exploration in depth is usually stopped.

METHANE is the simplest compound of carbon and hydrogen known, and is, next to hydrogen, the lightest gas known. It is formed in marshes, whence the name "marsh gas"—by the slow decomposition of organic matter under water. Bubbles of this gas will rise to the surface of the water, if the mud beneath be stirred with

a stick or otherwise, and will ignite. It is the "fire damp" of the mines and is also contained in the mixture of gases flowing from gas wells. It is colorless and odorless and but slightly soluble in water.

ROPE TRANSMISSION may be made effective for considerable distances. At the Silver King Co., Ltd., in Calico district, Cal., a pump was run by rope transmission half a mile distant from the engine. By the employment of properly adjusted sheaves, power may be transmitted around obstructions, such as buildings, mountain spurs, etc., which chance to be in the direct alignment of the plant.

THE present mining law of the United States requires that the end lines of a mining location shall be parallel, but it does not admit of their being other than continuously straight lines extending from the line on one side of the claim to that on the other. It is not necessary that the end lines should be at right angles to the side lines. Any variation from those conditions will result in the loss of the extralateral right.

GLASS is made of silica in connection with no less than two metallic oxides, generally potassium or sodium and calcium or lead oxides. By the kind of metallic oxides employed in its manufacture the glass is known as lead glass, lime glass, soda glass, etc. Various other minerals are used to give the glass the desired color. Manganese oxide gives an amethystine or purple color, iron gives shades of green or brown, arsenic produces white glass, etc.

THE collection of minerals belonging to the Field Museum, Chicago, numbers 125,000 specimens; many of these were gifts from World's Fair exhibits. The original collection was gotten together by Professor Ward, and during the Fair was exhibited in the gallery of the Mines Building. It is said that Prof. Ward received \$100,000 for the collection. The Museum receives gifts of specimens, it having many friends. Dr. O'Farrington is in charge.

IN buying running ropes it should be remembered that wear of ropes increases with speed, and where greater capacity is demanded it is advisable to increase the load rather than the speed. Hoisting ropes should not have a factor for safety of less than seven. That is, the strain which it should be called upon to withstand should at no time, even when old and worn, exceed one-seventh of its ultimate strength. Particularly is this applicable to ropes employed in hoisting men.

WHEN tellurium occurs in gold ores it usually complicates their treatment. If in small quantities with sulphurets the tellurides may be considered as a part of the sulphides, and require no particular care in the way of separate treatment, but if the greater part of the value be in the telluride the best method is to closely sort the richest ores and concentrate the low-grade ores with great care, preferably by double concentration. This results in giving a high-grade product which may be shipped to smelters.

AMALGAM obtained from batteries and mill plates, when cleaned and tightly squeezed, will usually retort about one-third of its weight in gold. This varies greatly, however, with the state of division of the gold. When the gold in the rock is very fine the amalgam retorts as low as 20%, or even less. The quantity of water that may be employed in milling gold ore varies within a considerable range. It is usually between 800 and 1000 gallons per ton. It is usually advisable to employ as little water as possible and do good work.

THE greatest mineral collection in the United States is that owned by the City of New York, and installed in the American Museum of Natural History of New York City. This collection has within the past year been entirely renovated and a new wing to the Museum given over to its use. The collection contains upwards of 300,000 specimens. The mounting and display is an admirable piece of work. The City of New York appropriates many thousands of dollars each year for the purchase of new specimens in the furtherance of the collection.

GYPSUM, the sulphate of calcium, which occurs native in extensive beds in many parts of the world, is used in many arts, manufactures and otherwise. It is manufactured into plaster of Paris; is used native as land plaster. It is also a good non-conductor of heat—useful in safe manufacture, and in lagging boilers, steam pipes, etc. Calcium sulphate forms often in the precipitating vats of chlorination works, as the result of adding iron sulphate to the gold solution for the purpose of precipitating the gold, the sulphur present uniting with the lime to form the calcium sulphate, which is found crystallized around the sides of the vats in a thick ring of white acicular crystals.

THE practice of leaving a pillar of ore around a shaft where the shaft is sunk in an ore body, is the outcome of disaster where this provision has not been given consideration. The size of the pillar should be determined by the extent of the ore body. If it be merely a vein, not exceeding the width of the shaft, a block of ore 10 or 15 feet on either side is sufficient, but if the ore body be large it may be necessary to have the shaft surrounded by a pillar 100 feet square, or even larger. The larger the ore body and the more extensive the excavations,

the larger should be the pillar. In view of this fact the advisability of sinking shafts in the country rock is made apparent. Due attention to this will often save much expense and trouble later when the stopes become large. If contemporaneous filling be practical, a smaller block of ore about the shaft is permissible than where timber only is used to support the excavations of the mine.

ROCKS are mineral aggregates, and may be simple, when formed of a single mineral, as calcite, or composite as diorite, made up of several minerals, as hornblende and plagioclase. The names of rocks should suggest their composition and usually do, as quartz-mica diorite, indicating that the rock is composed of hornblende and plagioclase, with mica and quartz as accessories. Granite is composed of quartz, potash feldspar and mica, as essential constituents, but it also usually contains numerous other accessory and unnecessary minerals. Accessory minerals are usually of local occurrence, and the fact that they are found in rock of a certain locality does not indicate that the same minerals will be found in the same rock mass at a short distance away.

DIABASE is a rock often found associated with gold-bearing veins. It is of common occurrence in California, and has been found in the Comstock region at Virginia City, Nev., and elsewhere. It is not always easy to distinguish diabase from other greenstones, however, without analysis or examination of a thin section by means of the petrographical microscope. It is coarse to fine grained and is usually a compact compound of (plagioclase) lime-soda feldspar, augite, and generally viridite (a green substance not easily resolvable into a definite mineral, but probably the result of alteration of augite), specks of iron ore (magnetite) and, as accessory, biotite mica, rhombic pyroxene and olivine, occasionally quartz. Two of the rock specimens from Tinton, South Dakota, are diabase, one fine grained, the other coarse, the latter with olivine. The third specimen of dark-gray rock with white specks is either syenite or diorite, the feldspars being too curious to determine their original character.

HYPOSULPHITE OF SODA is used in leaching chloride silver ores, or those which have been chloridized. The silver is then precipitated by the use of a solution of sodium sulphides. Ores containing chloride of silver may be tested for the presence of silver by this process on a small scale in a test tube in the following manner: Pulverize the ore, place in the test tube sufficient of the pulp to fill about one-third of the tube, then pour on a solution of sodium hyposulphite and shake vigorously. Allow to stand until clear, and then add a few drops of calcium sulphide, made by boiling lime in sulphuric acid. If silver be present it will be precipitated as a sulphide in black feathery flakes. Manganese, lead and copper all are soluble to some extent in the hyposulphite solution, and these, if present, are also precipitated by the calcium sulphide, but each has a characteristic appearance and can be determined by the expert in this method of prospecting for silver in ores.

IN geology a "fold" is a term employed to denote a bending of the strata. There are several kinds of folds. The anticlinal fold is one where the strata are uplifted in dome shape or in a long, ridge-like form, the rock sloping away from the crest toward the sides. A synclinal fold is that where a basin or trough-like depression is formed by the bending of the strata. A monocline is one where the strata is flexed upward from a horizontal or approximately horizontal position, and then assumes a flat position again beyond. Some broad anticlines are flat-topped, thus forming practically two monoclines, one on either side. An overturned fold is one in which the rocks have been so folded that the crest of the fold has been bent over, resting upon some portion of the fold beneath. Folding is due to lateral pressure. When this pressure is so excessive as to fracture the rocks a fault results. Faults seem to be as often the result of contraction as of compression. A normal fault is one in which the hanging wall rocks have slipped downward relatively to the foot wall side.

THE lead minerals are the most varied and beautiful of all mineral species. There are upward of a hundred now known; about every known color can be observed in these. There are but few lead minerals of commercial value, but from a specimen standpoint the beautiful lead minerals are held in high esteem and great value. Those most eagerly sought are native lead, cerussite, anglesite, clausthalite, jamesonite, boulangerite, mendipite, leadhillite, lanarkite, caladonite, crocoite, etolizite, wulfenite, pyromorphite, mimetite, endlitche, vanadinite, desclozite, nadorite, phosgenite and matlockite. The United States produces the finest specimens of wulfenites, endlitche, vanadinites and desclozites, as well as pyromorphite. Arizona, New Mexico and Pennsylvania produce by far the best of these minerals, the Pennsylvania pyromorphite being in several colors—green, brown and yellow—beautifully crystallized. England produces such rare species as matlockite, mendipite, lanarkite, caladonite, mimetites and phosgenites. Germany turns out some lovely pyromorphites, jamesonites and boulangerites, while Siberia and Africa are the only known producers of crocoite, the most beautiful ore of lead. Australia produces by far the finest specimens of the lead carbonates, cerussite and anglesite. A mendipite specimen crystallized costs up to several hundred dollars. This also applies to specimens of crocoite, caladonite and lanarkite.

Mineral Resources of Southeastern Alaska.

Written for the MINING AND SCIENTIFIC PRESS by
WM. M. BREWER.

During the past winter the writer spent several weeks in the Ketchikan mining district in southeastern Alaska, and while, of course, one cannot learn as much about the geology and prospective mineral resources during the winter months as he can during the summer, yet the writer is of the opinion that he gathered sufficient interesting information relative to the mineral resources of the district to warrant the present article.

The past mining history of southeastern Alaska dates back to the discovery and early development of the Treadwell mine on Douglas island about 1880, but no attention was paid to other than free-milling gold ores in the neighborhood of the Treadwell mine until after the Klondike excitement commenced in 1897. Then it was that rumors relative to the immense mineral deposits on Prince of Wales island first commenced to receive attention, and during 1899 and 1900 the reports of discoveries made created a stampede to the town of Ketchikan, which is the distributing center for the district embracing the mainland coast and islands north of the international boundary, and lying between that and the mouth of the Stikine river.

The extent of the territory comprising this district is enormous, especially when considered from the standpoint of the length of the coast line. One can hardly realize unless they actually travel along the coast of the mainland and islands in a small boat how great the length of coast line is. This has been caused by the numerous bays, inlets, coves and canals, the deep channels of which have been cut partly through erosion due to glaciation, and partly because of the volcanic action which has thrown up mountains and caused depression which to-day form the many bays and inlets.

If the prospector or mining engineer visiting this district has not already familiarized himself with the geology and mineral resources of the mainland and islands along the coast of British Columbia, he will be at a loss to determine the whys and wherefores of many interesting features to which his attention will be drawn. But a few seasons devoted to working in the province south of the boundary line will have enabled him to determine many material facts relative to the geological structure and occurrence of the ore bodies which otherwise might seriously puzzle him.

The similarity of much of the geology, and especially that which has influenced the formation of the ore bodies which exists between this northerly district and Vancouver island, is most striking. In the southerly district one finds immense ore bodies usually composed of magnetite, with impregnations of chalcopyrite, sometimes as large masses and at other times as crystals disseminated through the magnetite with variable degrees of regularity. These ore bodies usually occur either at the contact of limestone and basic igneous rocks, or else fill fissures in the latter rocks which have apparently been caused by contraction during cooling process. In the northerly district the writer found practically the same condition and were it possible to follow the line of strike of the country rock from Vancouver island to Prince of Wales island, it suggests itself to the writer that it is possible a mineral zone would be discovered maintaining in a fair degree, continuity the entire distance; but as such a course is impossible, the features possessing similarity can be merely referred to as suggestions from which precedents can be taken and comparisons made by the workers in both districts.

In addition to these occurrences of bodies of magnetite and chalcopyrite, one will find that bodies of bornite occur in both districts at the contact of limestone and igneous rock, and that closely associated with the ore bodies in both districts are epidote, garnet, hornblende, pyrrhotite and white iron.

These two characters of ore bodies occur, so far as the writer's observations have gone, in parallel zones, which zones are usually separated from each other by variable widths of country rock which in many places, where it has been examined by the writer, is not mineral bearing. As an illustration of this characteristic one finds in the eastern portion of Prince of Wales island, especially on Kassan peninsula, immense outcroppings of magnetite with chalcopyrite impregnations occurring in igneous country rock, designated by Mr. Brooks of the U. S. Geological Survey as greenstone; while on the western portion of the island, around Copper mountain, are found occurrences of copper carbonates and bornite as contact deposits between limestone and igneous rocks. The same conditions can be found on Vancouver island on the western side, where, in the mountain range which extends parallel to the coast line and crosses many of the rivers which empty into the heads of some of the longest inlets, large deposits of magnetite carrying chalcopyrite, occur; and in a parallel zone, a few miles to the westward, contact

deposits of bornite between limestone and igneous rocks have been discovered.

Another similarity with regard to the mineral resources of these two districts is the fact that, in both, veins of gold-bearing quartz occur, usually in schistose rocks in the near neighborhood to intrusive dikes of granite.

The development in the Ketchikan district has been, up to the present time, too limited in extent to warrant the expression of any decided opinion as to the prospective value of most of the discoveries so far made.

By far the most numerous discoveries so far located belong to the class of magnetite deposits carrying chalcopyrite, with marcasite, epidote and garnet closely associated.

The localities where the most extensive prospecting and development work have been done are as follows: On Prince of Wales island, on the Kassan peninsula, on the eastern side of the island; near Karta and Hollis bays at the head of Kassan inlet, at Port Johnson, also on the eastern side of the island, but a considerable distance south of the Kassan peninsula; Niblack Anchorage, also on the east side of Prince of Wales island; on Copper mountain, on the western side of the island; at Thorn Arm, on the western side of Revillagigedo island; also about 1½ mile from Ketchikan, on the Revillagigedo island.

The occurrences of mineral on Kassan peninsula on which the most extensive development work has been done are magnetite, or pyrrhotite, carrying variable values in gold, silver and copper. These values sometimes run as high as 15% or 16% copper, \$2 or \$3 in gold and two or three ounces in silver, but if an average of the entire ore bodies is taken, then these values run very much lower. Indeed, this class of ore bodies must be characterized as large bodies of low-grade ore. Sometimes they are found to reach a width of 50 or 60 feet, and to occur in lenses of 200 or 300 feet in length. While there is a mineralized zone apparently extending along Kassan peninsula from southeast to northwest, and among the local prospectors the term "leads" is often used to describe these occurrences of ore, this term is really a misnomer, because the structure of all the ore bodies so far discovered along this zone is lenticular, and the mineralization, so far as gold, silver and copper values are concerned, is very bumpy. The most extensive development work performed on the peninsula is on the following locations: The Mount Andrew, Mamie, Copper Queen, Poorman and Copper King.

It is a serious question as to what proportion of the ore so far discovered will pay to ship, and equally as serious a question as to whether the prospects have sufficient prospective value, notwithstanding the apparent extent of the ore bodies to warrant the erection of a local smelter when the cost of coke is considered. All fuel for such a plant would have to be brought in from Vancouver island or the State of Washington, unless the coal beds reported as occurring on Queen Charlotte island are developed and proved to contain coking fuel.

To the westward from this zone carrying copper ores there occurs a zone carrying gold-bearing quartz. This is represented by the discoveries made near the shore of Hollis bay and in the vicinity of Port Johnson. The former locality has been considerably prospected, but most of the work done has been concentrated on two groups, the Cracker Jack and Golden Fleece. The most important discovery made in the latter locality is the Valparaiso. From all of these locations sample shipments of limited quantities of high-grade gold-bearing quartz have been made to coast smelters.

Near Karta bay, at the extreme head of Kassan inlet, copper ore has been discovered and prospected to a considerable extent. Judging from the samples brought from that locality the ore would appear to be of a much better average grade than the copper ore on Kassan peninsula, but while the discoveries on the peninsula are convenient to deep water, those near Karta bay are much further removed.

On the western side of Prince of Wales island work of development has been confined principally to Copper mountain and vicinity. The predominating character of the ore is copper carbonates and bornite, but gold-bearing quartz had also been found on this same side of the island, carrying high values.

On Revillagigedo island, near the head of Thorn Arm, and also in the vicinity of Ketchikan, gold-bearing quartz has been discovered occurring in a chloritic schist, and at the Sea Level mine on Thorn Arm a 30-stamp mill was in operation during the winter. This belt of schistose rock is apparently very persistent along its line of strike, which is from southeasterly to northwesterly, but, judging from the conversation of the oldest prospectors, has received but comparatively little attention except in the vicinities noted.

The future of the Ketchikan mining district depends entirely on the grades of the ores discovered, metallurgical methods necessary to reduce these ores, cost for treatment of the same, and last, but not least, the influx of capital from the outside.

THE use of metal tamping bars in mines is extremely dangerous and should be prohibited by superintendents. Colorado has a State law making it a misdemeanor to employ a metal bar of any kind in tamping holes.

Cyaniding Tailings in Sierra Co., Cal.

Written for the MINING AND SCIENTIFIC PRESS by H. R. CASE.

During the summer of 1902 I leased the cyanide plant at the tailings deposit of the Young America quartz mine, near Sierra City, Sierra county, Cal. The plant built in 1896 was operated about five months and closed down for lack of water power, remaining idle until last season. The property is at such an altitude that the season is very short, and, being 50 miles from a railway, can only be operated to advantage during the summer months. The tailings from the 40-stamp mill, since destroyed by fire, were conducted ½ mile by flume and deposited in a small deep pond at the foot of Sardine lake. The leaching plant is on the side hill opposite the tailings deposit and consists of a 200-ton sand-storage tank of 2x12 inch plank; four twelve-ton steel solution tanks; four redwood leaching tanks, 25 feet in diameter, and of eighty-five tons capacity, fitted with one side discharge gate and filter bottoms of 1x2-inch slats, covered with cocoa matting and ten-ounce duck; two sixteen-ton gold tanks of white pine and four ten-ton steel sump tanks.

It was necessary to rebuild the leaching tanks, for, when first erected, each stave was toenailed to the tank bottom, so that it was quite impossible to draw the staves together with the hoops. It was a queer example of how not to build circular tanks. When rebuilt the tanks were quite tight, but now and then a leak would break out of some old nailhole which made constant care necessary.

The power for solution pump, sand pump and vacuum was derived from a limited water supply, 250 feet up the hill from the mill, brought from an abandoned tunnel after the snow disappeared, 2 miles back in the mountains and delivered to the mill through 12 and 8-inch pipe from the penstock.

The water in the pond was pumped by a 6-inch centrifugal pump operated by a 5x5½-inch Westinghouse steam engine. Six hours pumping each day kept the water down so as to provide a 6 to 8-foot bank of sand which was washed down by a jet from a ¾ inch garden hose to the intake of the suction line of 4 inch threaded pipe connecting with a 4-inch hydraulic elevator using 1 inch nozzle. Two of these elevators were in use, one lifting the sand about 24 feet to an intermediate tank divided by partitions, so that the sharp leachable sand fed automatically to a second elevator, while the slimes, which only assayed 60 to 75 cents, passed off with the surplus water. The second elevator delivered the sand to the 200 ton storage tank, from which it was sluiced when wanted to the leaching tanks, one man emptying and filling a tank in six to eight hours. The 4-inch sand pumps, working twenty-two hours a day, just about furnished the sand required for six tanks each week. As soon as the tanks drained so the sand could be hauled off, thirty tons of two to two and one-half pounds cyanide solution were run in, each ton containing one pound of fresh cyanide, after which only sump solution, titrating one and one-half pounds down to sevenths pound cyanide per ton was used.

After running on twenty tons of strong solution the gold made its first appearance, the effluent assaying 15 to 20 cents per ton. From this the values increased rapidly up to \$1.50 to \$2.50 per ton, depending on the quality of sand being treated. After receiving sixty to seventy tons the solutions gradually decreased in value until 120 to 140 tons had been applied, at which time they assayed 20 to 30 cents. Twenty tons of wash water were then added and the tank sluiced out. The time of treatment, including filling, was four and five days, so that with the four leaching tanks we filled six tanks each week.

Precipitation was effected in forty-eight sheet-iron boxes, each holding ¾ cubic foot of zinc shavings, placed in series of six. Very little gold passed the third box, and the solution after zinc seldom assayed over 5 cents per ton. As the sump solution tanks were of ten tons capacity all solutions were run in ten-ton lots and a drip sample representing the work of each shift before and after zinc, saved from each ten-ton lot, was assayed every morning; this indicating very closely the previous day's saving on the zinc and the condition of the solution regarding precipitation. I also assayed a sample of the solution coming from each tank at 7 A. M. and a sample of the sand before and after treatment for each tank. By this work conditions never went very far wrong and I knew just what we were doing each day, the final figures for the season proving the general accuracy of the daily work, for the solution and sand assays, and the bullion receipts checked within a fraction of 1%. We cleaned up every two weeks, treating the slimes at the mill and shipping the bullion, 900 fine in gold and silver, to Selby Smelting & Lead Co., San Francisco, Cal.

The average assay of the sand for the season was \$1.50, though during the month of September the average was only \$1.13. The net extraction for the season, 76.3%, could have been increased somewhat by longer treatment, but considering the short season, the grade of tailings and the capacity of the plant the time employed yielded a larger net profit

than a longer treatment and greater extraction could possibly have done.

The costs per ton for the season's run of 9700 tons are as follows, wages paid laborers averaging \$50 per month and board:

Cyanide costing 25¢ per pound, delivered.....	\$13.72
Caustic soda.....	60
Zinc shavings, at 16¢ per pound, delivered.....	4.70
Labor, wages.....	20.70
Labor, board.....	6.83
Water for power.....	1.03
Oil and waste.....	40
Assay supplies.....	2.00
Charcoal.....	1.50
Sulphuric acid.....	90
Express and smelter charge.....	1.04
Repairs.....	1.44
General expense.....	1.05
Total.....	\$55.91

Separation of Gold From Copper.*

Written by F. R. CARPENTER, M.A., Ph.D.

The metallurgical product obtained in pyritic smelting is ordinarily a low-grade copper matte. In the revival of this ancient process of smelting the old methods of refining and separating the gold and silver from the matte have received but little attention, owing to the fact that it could be readily sold to the lead smelters. As long as competition existed between them this left nothing to be desired, and even now, when every matte smelter is, in a small way, a competitor of the American Smelting & Refining Co., commonly called the "trust," very good terms can be made; but as the trust is not an eleemosynary institution, it does not do this refining as an act of charity. Besides, one is always haunted by the fear that they may some time refuse to do it at all.

In the old days of European practice refining the matte was always done at the works where it was made. It was usually accomplished by a process known as lead soaking, and if the matte carried copper this was supplemented by lixivation. Both processes were truly ancient, but when combined, as at Kongsherg, Norway, they were very effective, and held their own until displaced very recently by electrolysis. I wish to remark that the matte obtained in pyritic smelting differs in no way from that obtained in the reverberatory process, except, perhaps, in the per cent of copper, and not always in this, as at Zalathna and at Deadwood. It is also worthy of remark that when pyritic smelting was generally employed at Freiberg, some three hundred years ago, the reverberatory furnace was generally preferred to the blast furnace as in every way more economical, but at Mansfield, Saxony, which process I modified for use at Deadwood, the blast furnace has always been preferred. In Wales, in Butte, Mont., and in other places, the reverberatory still holds its own, but the product is everywhere the same, viz., a matte with varying percentages of copper, gold and silver.

In the present state of metallurgical knowledge the best way of treating this matte would be to concentrate it to black copper and employ electrolytic methods. But pyritic smelters are not usually of sufficient magnitude to justify an electrolytic plant, and the difficulties in the way of sampling and selling the black copper are very great.

In connection with my son—Arthur Howe-Carpenter—I have made many experiments, often at considerable cost, trying to devise some method whereby the matte might be refined at the plant where it is made, some account of which may be of interest to the society.

At Mansfield amalgamation of the matte gave way to the Augustin process, and this in turn to the Zier-vogel method—a beautiful process, but one requiring much skill, and not providing for the extraction of gold—a matter of no import at Mansfield, as the ores are exclusively silver-copper. When the process was introduced into America it became necessary to supplement it with some means of saving the gold, but how this was accomplished, beyond the fact that the gold is first concentrated into copper bottoms, we are not informed.

I began my work at this point. I do not know the name of the genius who first refined copper by means of the copper bottom process, but it is ancient, and was long employed in Wales in the process for making "best selected copper." It was, also, very early known that these bottoms carried down, with the other impurities of the matte, practically the whole of the gold, and a process for treating the gold contained in these bottoms was well known and employed for its recovery as early as 1780. In the copper bottom process it will be remembered that the matte is enriched by washing and resmelting until it carries about 60% to 65% of copper. This enriched matte is subjected to a roasting whereby a reaction takes place between the oxide and the sulphide, and a certain per cent of metallic copper is set free, carrying down with it many of the impurities existing in the matte, and among them almost all of the gold. This selecting process has been most fully examined and set forth by Allan Gibb, to whose work reference

may be had for details. Now, when one remembers how the first bottom is obtained, which should equal 14.2% only of the copper of the original matte, all he needs to do is to cast this copper hack into matte, and repeat this selecting process upon a smaller scale, or until a bottom of sufficient size is obtained to be refined by any of the ordinary methods. This is the process described by Jars in 1780, and which was employed—but doubtless with some modifications—by certain Welsh smelters until comparatively recent times.

We first sought to modify this process, and later to apply it to the winning of the silver also. My first idea was to take these bottoms and cupel them directly with lead. This worked very satisfactorily, but gave a by-product to be refined. We next tried cupelling the copper direct, as though it were ordinary lead bullion instead of copper. At first this goes on very slowly, but when the bath becomes saturated with cuprous oxide it goes on very rapidly. It differs in no way in principle from the cupellation of lead. We next tried the scorification of copper with silica, and, lastly, we roasted the copper, which, if in thin sheets or if granulated, may be done somewhat slowly, depending, of course, upon the thinness of the sheets or granulations, and this we smelted with silica until the quantity of metallic copper was sufficiently reduced for refining the gold. This gave the best results of all. None of them provided for the recovery of the silver, which did not remain with the gold, but was lost in the residues. In the class of work in which I have been engaged a large percentage of copper in the charge is not desirable. The cleanest slags made in Deadwood were made in reverberatory furnaces, and the matte carried only from 3% to 5% copper. I, of course, made a very large percentage of matte of very low gold and silver contents. This matte was added direct to the blast furnaces and there concentrated. But even in blast furnace work it is desirable, where gold and silver production is the primary object of smelting, that the matte shall not exceed 10% in copper. Now, one may roast this matte and smelt it with siliceous ores until it reaches any desired degree of concentration. We may bring it to the point employed in the copper bottom process, but while 15% of reduced copper will free the regulus from gold, the whole of the silver can not be so recovered, no matter what per cent of copper is so reduced. I may remark that silver reaches its maximum concentration in bottoms, according to Allan Gibb, when 19% of copper is so separated, but as 42.5% of the silver may be so recovered, the remaining 81% of the regulus may be sold to the copper refiners, as the difficulty of sampling is greatly lessened by this treatment, and we have recovered the bulk of our values in the 19% bottoms, which we may treat ourselves.

Instead of stopping at the point required by the copper bottom process, we may concentrate the whole of the matte to black copper, which will carry all the gold and silver of the original matte, save that which has been lost in the slags while concentrating it. These rich slags are added, of course, to the ore charge and their values thus recovered. If we now proceed to treat this black copper exactly as we treated the copper bottoms we shall indeed recover the gold, but the silver will mainly go into the residues, as before, but they now carry the whole of the silver, with little or no gold, and are either silicate of copper or copper oxide. In either case the reduction of a small percentage of metallic copper, unlike the bottoms in the Jars process, will carry down the silver. I am not aware that this has heretofore been published. It is, also, fair to state that this has not been done on a working scale, but laboratory tests promise success.

If the copper bottom process is employed, it may be done as follows, although other methods are known: Say ten tons of 65% matte is placed upon the hearth of a small reverberatory furnace. The doors are left open and the charge fired for six to eight hours, or until a semi-pasty stage is reached. The doors are then closed and the charge melted down. The reaction between the oxide and sulphide, as in the "direct process," sets free a certain percentage of copper, which Allan Gibb determined to be 14.2% for best results. The whole charge is now tapped into moulds, and beneath the slag blocks nearest the furnaces will be found sheets of impure copper—or copper "bottoms"—whence the name. We have now concentrated the bulk of the gold into a ton and a half of material for further treatment, which may be returned to the same furnace, roasted in all respects as the original ten tons, again smelted down, the copper oxide slagged off and the copper tapped into sheets or granulated for further treatment upon a copper test or other furnace, where it is again roasted and slagged with silica until sufficiently reduced in quantity to refine the gold with litharge, niter or other flux.

STRIKES continue to disturb industrial conditions throughout the United States. At present the seat of these troubles is principally in the East, the Western mines, for most part, being in operation, strikes either having been settled or averted temporarily. Some of the strikes are in "sympathy," but it is safe to say that the "sympathetic strikes" in few instances have the sympathy of the public, and this is an important factor in a strike.

The Making of an Oil Well Bit.

An oil well hit, in the first place, is not a cutting tool but a hattering tool, or hattering and pulverizing tool, although it is necessary to have, to a certain extent, a cutting edge on the hit. This cutting edge is built with a very short bevel on the center of the hit, the outside being kept fairly sharp and acting as a rimmer to keep the hole to certain dimensions, says a writer in Sparks From the Anvil.

The most important part in the beginning to make an oil well hit, is to have the right kind of steel of the right carbon—combined with other good qualities known to the steel maker—so that the hit when in service will not hatter, yet will be so tough as not to break under ordinary usage.

In making hits as they are commonly made now, and have been for a number of years, the first thing to do is to make the shank or pin end of the hit. This is done in various ways, some makers using axles, cutting them up and building what is known as a fagot, using as many pieces as may be necessary and welding them together into a har, which is drawn into the shape of the top end of the hit.

This is then cut off the har, or, in some instances, left on the har, the end being split; but previous to this process the steel is heated, drawn, and scarfed under a hammer in such a way that it can be locked into the end of the shank; it is then welded by taking a welding heat in the fire and drawing it down under the hammer.

This part of the process—the welding—is one of the most important of all in the making of a hit, and it should always be done carefully in a fire that has plenty of coke under the hit, so that the cold blast cannot come through. It makes but little difference how rapidly the metal is heated if the fire be large enough, but a great deal depends upon that part of it; a shallow fire is one of the worst things possible in doing this class of work.

The blade is formed and a concave is put in under the hammer with a pair of fullers. These fullers are made in various shapes and in accordance with the dimensions of the bit, or the order of the driller.

Another very important observance in making the hit is to get as much as possible out of each heat by working as much of the blade as can be managed at a single heat, instead of heating up the different parts separately. This method avoids all unnecessary heating and gives an even quality to the steel all through.

It is also necessary to watch very carefully that the fullers are not driven too cold, as this spreads the bit at a time when it is cold and puts too much strain at the center, which has a tendency to pipe the hit or split it.

Of course we all understand that if even the best of steel is hurt it is practically ruined, so it is necessary to be very careful in heating in order that there may be no burning or scorching of edges.

After the blade is formed and the end cut off to the proper shape to be easily dressed, the hit is turned around and the shank is finished; the square is drawn to proper shape and size; the pin is drawn down and the collar is finished to the size needed to go in the lathe; after being turned up it is ready for use in the well.

The latest and most modern hits, those that are most satisfactory in present day usage, are hits made of one piece of steel. In making a hit of this kind, the most important and necessary part of the process is to keep the fire at an even heat while working, being careful not to overheat in any way and not to hammer too cold.

The hit is drawn to any size and dimensions that may be required, the smallest hits drilling holes from 2½ to 3 inches diameter and the largest drilling a hole 36 inches diameter, or even larger in some instances. In the very largest hits it is necessary to make a few modifications, but hits can be made of practically almost any dimensions and still be entirely effective.

An important requirement in solid steel hits of the present day is that the pins shall not cup in use; some are very strong and stand an immense amount of hard usage before breaking. Another requirement equally important is that a thread which is provided for making a joint between the hit and the auger stem box shall be strong and stiff and not easily stretched.

After the hits are turned and finished it is then necessary to dress them to the proper size for the holes that are to be drilled, allowing a little clearance so that the body of the tool will not rub the edges of the well.

After the final heat it is set in a shallow tub of water which covers only the very end of the hit, where it is hardened as hard as possible and then drawn to the degree of hardness suitable for the work required or the kind of rock that may have been encountered.

When working in hard rock more care must, of course, be given in dressing a hit than where the rock is softer. How necessary it is that every point should be guarded in making a well hit will be appreciated when it is realized that these hits often operate in wells that are nearly half a mile deep,

*Proceedings of the Colorado Scientific Society.

while it is a fact that one well not many miles from Pittsburgh, Pa., was drilled to the depth of 6000 feet, or 720 feet more than a mile, the tool used in drilling being of ordinary size.

Radium.

The newest element discovered—radium—continues to interest all who follow scientific investigation. "The more it is studied, however, the more remarkable it becomes from every point of view," says the Iron Age, "and the results of recent experiments with it are so startling and threaten to undermine so many of what have come to be regarded as the basic truths of physics that even those for whom radium has no immediate or practical interest should be advised of its surprising phenomena. At the moment pitch-blende is the storm center of scientific controversy and the focal point of scientific interest. In it may lie a new source of power which will revolutionize not only mechanics, but possibly physics and chemistry as well.

"Up to quite recently radium was regarded much as calcium chloride had been in the days when luminous paint was a curiosity. It was known to possess the power of radiating light, but was supposed to possess this quality by reason of the fact that it had absorbed light from the sun's rays. The extremely interesting discovery of Sir William Crookes that the ions, or atomic emanations, from radium could be rendered visible changes the point of view from which this extraordinary mineral must be regarded. Professor Lippmann, of the Sorbonne, whose standing in France is equivalent to that of Lord Kelvin or Lord Rayleigh in England, seems to have established the fact that radium has the power of continually generating heat without drawing upon any external source of energy. If this be true, every one with the least or most superficial knowledge of physics will see at a glance that this phenomenon gives us a new science and compels a revision of our accepted ideas on many subjects. As has frequently happened before, Crookes' discovery of the heat generating properties of radium, while it comes like a revelation, is merely the recognition of properties inherent in many kinds of matter, and previously suspected, if not accurately described. The difference appears to be that radium possesses these properties in higher degree than any other substance at present known. Some, with a taste for excursions into the by-paths of scientific literature, will perhaps recall the generalizations of Seguin in explanation of a phenomenon which had puzzled the physicists.

"It was noticed many years ago that a coin or a print, if shut up in a box in proximity to, though it may not be in contact with, a sheet of blank paper, was found in time to have impressed its own image upon the blank sheet by a process of photography chiefly, if not exclusively, operated in the absence of solar light. These pictures were at first regarded as profound mysteries, explainable only by assuming that superhuman agencies had produced them. Seguin suggested the explanation that the bodies capable of producing this phenomenon did so by giving off a stream of impalpable particles projected from themselves with high velocity, and that these particles were capable of producing an impression upon what they bombarded. His hypothesis was received with hilarity by the physicists, to whom the idea of such a radiation of matter, even in infinite attenuation, going on forever without any sensible loss of weight or bulk in the mass drawn upon, was inconceivable. For that matter, it is inconceivable still, but it is becoming evident that Seguin discovered the only explanation of a series of phenomena which find their highest known development in the behavior of uranium and radium. The matter was practically forgotten until 1896, when Becquerel, in the course of some interesting and important experiments with the salts of uranium, observed that they maintained a constant radiation, that the rays thus given off possessed in common with the X-rays of Rontgen the astonishing power of passing through substances distinctly opaque to solar radiation, and that the rays thus transmitted through plates of metal, for example, were able to make a distinct impression upon a sensitive plate which would be acted upon by the actinic rays of solar light. If a small mass of uranium was inclosed in a light, tight box with a photographic plate, and an opaque object was interposed between them, the form of that object was distinctly reproduced upon the plate as in the shadow pictures of the Rontgen skiagraphs. The novel feature of the radiation from a crystal of any of the uranium salts was that apparently no exciting cause was needed to produce or maintain it. In the case of the Rontgen rays the application of external energy is necessary to excite the vacuum tube and produce the X-radiation. Uranium, however, has this energy within itself. Its radiation appears to go on continuously, and is apparently unaffected by any treatment to which the crystal is subjected, such as heating, electrification or solution in acid.

"If this be true—and all observations thus far made warrant the belief that it is—the axiom of physics that all energy is but the mechanical equiv-

alent of energy previously exerted to produce it, and that all work is but a credit to balance a debit previously recorded, would seem to need revision. The later experiments of Becquerel, and of M. and Mme. Curie, with uranium and the last addition to the group of elements found in association with it, radium, give us phenomena which in their relation to other phenomena so universal as to warrant the formulation of laws which have thus far not only passed unchallenged, but have satisfactorily accounted for pretty much everything dynamical, may very well pass to classification as miraculous. The fact that they are not miracles, but are manifested in obedience to a well-established natural law of invariable operation, has caused the physicists to look at one another and ask if it can be true that modern science has huddled upon a cornerstone which has crumbled under it.

"The assumption that the Becquerel rays, which have been recognized as originating in certain new elements of which radium is the most active of those thus far known, are not streams of material particles forever flowing from their source without diminution or change, but mere vibrations of ether, like the Hertzian rays employed in wireless telegraphy, would have saved a great deal of trouble, but unfortunately this was rendered untenable by the discovery that if such a stream of radiant energy was allowed to fall upon an electrified body it would discharge it precisely as a jet of tangible water would do. And now Crookes has made these rays visible, and Professor Lippmann has established the fact to the satisfaction of the French Academie des Sciences that radium is capable of producing sensible heat ad infinitum, without consuming itself or anything else so far as has been determined.

"Whether these discoveries have any economic value or not is of less immediate concern than the effect they will have on science. A century ago they would have been regarded as establishing the hypothesis of phlogiston as a property of certain kinds of matter, and we should be compelled to regard radium as the most highly phlogisticated of known substances. Probably we can do better, however, than to go back to that particular starting point for a new departure.

"Meanwhile, two questions of great interest will probably occupy the physicists for some time to come. One is, what property of matter permits any form of it to maintain a practically eternal energy in expelling a stream of fragments of its own mass? The other is, what is the form of matter thus projected? It has been assumed with some show of plausibility, as the result of calculations from the imperfect data now available, that the radiation of radium would in about 10,000,000,000 years reduce the mass about one grain in weight for each square inch of surface. Obviously it cannot be projecting the atoms of the Dalton hypothesis. These units of the molecular groupings, however small, would exhaust it at a much more rapid rate than that assumed in the case of radium. The form of matter expelled must be infinite subdivisions of the mathematical unit called the atom; perhaps the primordial matter of the alchemists. The narrow door thus placed invitingly ajar may lead to truths of which the students of the middle ages had a clearer perception than those of modern times, who know more and dream less, and whose imaginations are hampered by the desire to prove all things. It may be we shall be no happier and no better off when we know why radium behaves in a fashion so extraordinary; but the world is full of wise men who cannot rest until they do know, and it may very well happen to them, as it has to others, that in searching for the end of the rainbow they will find a great many things they were not specially looking for which are of immediate and immeasurable utility. That we could not usefully employ radium if we had it in masses is probably due to reasons which have discouraged the search for the universal solvent—we have nothing to keep it in."

Assaying Cyanide Solutions.

TO THE EDITOR:—I have noticed from time to time in your valuable paper different processes for precipitating solution assays in cyanide plant, all of which I have given a trial, but have found none as simple or more reliable than the one we are using at Smuggler-Union mill at Telluride.

FORMULA:—Take 875 c. c. solution or 30 A. T. in beaker, add about 2 grams zinc dust, about what can be lifted on knife blade or small spatula and about 50 c. c. Com. H_2SO_4 . Stir occasionally, allow to set until all action ceases, filter through 24 c. m. filter, burn and assay.

A less tonnage could be run for higher value solution.

The following flux is very satisfactory: Silica added to filter. Potas. carb., 1 pound, 5 ounces; hi-carb. soda, 2 pounds, 12 ounces; borax glass, 1 pound, 5 ounces; flour, 8 to 12 ounces; litharge.

While this method does not check out with the clean-up, still the relation is very constant, having at this mill never been lower than 80% or more than 81% of the gold; lower than 86% or more than 88% of the silver actually recovered in the clean-up.

Telluride, Colo., May 8.

A. H. JONES.

Deposition of Ores in Limestone.

Written by W. P. JENNY, E. M.

A study should be made of the structure of the ore-bearing limestones, with the special object of determining the causes that have made certain strata favorable for ore, while other beds in the same geological formation, having an almost identical chemical composition, and so situated that they are traversed by the same fissures, through which the mineral-depositing waters have been introduced, have remained barren. In many instances the productive and the barren strata are inter-bedded and so situated that the ore-bearing fissures cut through all the beds alike, without any change in this selective deposition of the ores.

Analyses of the ore-producing limestones are needed to determine the amount and character of the carbonaceous substances present, and also the minute traces of other elements, some of which may be found to have had an influence on the formation of the deposits. That such an influence may have been exerted seems probable, when we consider the enormous masses of the highly soluble limestones that have been dissolved or replaced in the creation of ore bodies. It has been shown, for example, that the small percentage of bitumen or other hydrocarbon contained in the rock, and set free by its dissolution, has strongly aided in the deposition of the ore.

Prof. Church, discussing the deposition of ores in limestone, says: "The operation of solutions whose composition we do not know can be judged only by their effects. When metasomatic replacement takes place in limestone, it is generally assumed that lime-carbonate goes into solution, while its place is taken by the ore substances—that is to say, that the action is molecular substitution, and not atomic; but it is conceivable that the change should begin by an interchange of acidic elements; that SiO_2 should drive out CO_2 . Subsequent changes might remove the lime-silicate by another process of substitution, since it is more soluble than silica. In the Tintic mines, of Tintic district, Utah, lime-silicate does not appear to have been formed; the silica directly replacing the lime-carbonate, or the carbonate of lime and magnesia, as the case may be; but the point is that CO_2 would be liberated, and though the original ore solution were free from CO_2 , it would immediately become charged with that agent and exert the well known dissolving power of carbonic acid solutions. In this way a solution which would have but feeble power in other rocks may in limestone set up a chain of reactions that would intensify its effects. Limestone contains the elements for self-destruction, since the breaking-up of one lime carbonate molecule may cause the solution of another; and as this cannot be said of any other rock, we reach a possible explanation of the comparative frequency of ore-bodies in limestone. The dolomites would, of course, present similar reactions." Prof. Church continues, respecting "The selection of a favored stratum for ore-deposition. In some situations the solutions, before reaching the stratum of actual ore-deposition, must have passed several strata, suitable for their action, if they had possessed from the beginning the power of solution which they showed ultimately. Ore-solutions exhibit a selective power which is extraordinary in a water fully supplied with dissolving qualities, but quite explicable in a solution which lacks this power."

Many contributory causes have in all probability co-operated in the deposition of the ore, such as decrease of pressure and reduction in the temperature of the solutions, the mingling of mineral-bearing waters of different chemical composition entering the limestone formation through distinct fissured belts, etc.; but the important factor appears to have been the great solubility of these limestones and dolomites in the waters which brought in the minerals, joined with the chemical activity of the contained hydrocarbons released in the dissolution of the rock.

In the solution of the limestone, the incidental liberation of large volumes of carbonic acid, ever dissolving more and more of the rock, set free a constantly renewed supply of carbonaceous matter, whose function was to remove all free oxygen and reduce the sulphates in the waters to sulphides. At the same time, the calcium and magnesium carbonates, when dissolved, neutralized the acids and destroyed the chemical equilibrium, so that the mineral-saturated waters could no longer hold the metals in solution, after the addition of the elements derived from the limestone. The combined action of the carbon, hydrogen, lime and magnesia contained in the rock was to deoxidize the solutions and bring them to the "critical point," when deposition of the ores rapidly took place.

The ores of primary formation in the Tintic mines have been, in most of the occurrences, deposited from highly heated solutions by the metasomatic replacement of the limestone; only in relatively subordinate amount have the metallic sulphides been

*Trans. Am. Inst. Min. Eng.

formed by crystalline growth in the rock, or by crystallization in the interspaces of the ore bodies.

In the instance of the Uncle Sam mine, in the large body of steel-galena, without quartz, replacing the fractured lime strata, the deposition seems to have been from solutions either free from silica, or more probably of so low a temperature that the chemical reaction in the substitution of quartz for the lime-carbonate could not take place.

In Tintic, the limestones, when unaltered, retain the included carbonaceous matter deposited with the sediments. In the ore bodies, all forms of the hydrocarbons have been destroyed, either in the primary formation of the minerals or in the subsequent oxidation; the deepest mines in the district (1700 and 2100 feet, vertical depth) not having reached ground-water level.

Whatever may have been the role of the volatile hydrocarbons in the original creation of the deposits, no evidence has been found of their ever having been present. Tintic district has been a center of intense volcanic activity, and it seems almost inevitable that, with the presence of notable quantities of bituminous matter in the rocks, volatile hydrocarbons should have been formed.

Many examples might be given of limestones, especially of magnesian limestones, which carry more or less organic matter and constitute the favored geological formations in the selective deposition of the ore.

A Steam Traction Engine.

One of the most notable features of the development of some of the mining regions of the West has been the employment of traction engines as a means of economical transportation. Particularly have these proven useful in the deserts of California and Arizona, where they have been of great service. In



McLaughlin Steam Tractor.

the lumbering regions also where mine timbers are cut and sawed, these machines have displaced animal teams to a great extent because of their high efficiency and economy. They run readily over any road where a team can haul loaded wagons, and make considerable grades with ease, drawing long trains of wagons at a rate of speed equaling that of animals engaged in the same class of work. The accompanying illustration is that of the McLaughlin steam tractor, manufactured by D. W. McLaughlin & Co., at Emeryville, Cal. The engine, the manufacturers say, is simple in construction, combining the maximum of power with the minimum of parts and weight.

Leveling by the United States Geological Survey.

One of the preliminaries in the preparation of topographic maps by the United States Geological Survey is the accurate determination of the elevations above sea level of numerous points in the area to be surveyed. These points are marked by what is technically known as "bench marks," which ordinarily consist of iron posts, $3\frac{1}{2}$ inches in diameter and 4 feet in length, set 3 feet in the ground. Each has a brass cap appropriately lettered, on which the elevation above sea level to the nearest even foot is stamped with steel dies. In the mountainous and rocky areas of the West, in addition to these posts, aluminum tablets lettered like the caps in the posts are set with cement in holes drilled in solid rock.

A law of Congress requires that this work shall be done in all localities under survey, and many thou-

sands of miles of lines have been run and marked in this way.

Level parties in the Rocky mountains are always provided with camp outfits, and consist of the levelman—who is also the chief of the party and must be a skilled man—a rodman, a teamster, and a cook. During the past season's work in the Rocky mountains there were parties of this kind at work in two or more localities in Montana, Wyoming, Utah, Colorado, New Mexico, Arizona, and Texas, in addition to those in the adjacent States.

Silver Mining and Smelting in Mongolia.*

Written by BENJAMIN SMITH LYMAN.

Mr. Woo's succinct description of the mining and smelting of silver-lead in Mongolia, with the roasting and reduction process and cupellation, has much interest as a picture of methods that not only may have been in use, as he suggests, a thousand years ago, long before the existence of mining schools or chemical laboratories, but probably very little, if at all, from the practice of prehistoric times, when King Priam's handsome silver vases, cups and bowls were formed. For it is highly improbable that such large objects were made from comparatively rare native silver, and the metal must have been smelted from ore, and most likely in great part from galena, with cupellation of the lead.

Dr. W. A. P. Martin, in his excellent book on "The Lore of Cathay," points out that Chinese alchemy is over 2000 years old, antedating the European by at least six centuries, and he infers that the Chinese skill in metallurgy and many branches of practical

(last) cake of slag of the preceding operation; $23\frac{1}{2}$ pounds of iron coins, or $19\frac{1}{2}$ pounds of new iron; 58 $\frac{1}{2}$ pounds of charcoal (costing about 1 cent a pound). The operation lasts two hours, and there are three operations in the morning; in the afternoon the hearth is repaired. The product is about 50 pounds of lead to each operation, or 150 pounds a day. The lead, except the poorer part, is cupelled by two women on a hearth of common wood ashes, and the litharge is afterwards reduced again to lead, with a loss of 25% to 30% of lead in the whole process. As already seen, the monthly product of silver ($1\frac{1}{2}$ pound avoirdupois) is about one-half of a tenth of 1% of all the lead. * * * * The smelting operations are extremely interesting, as agreeing closely in many respects with the processes of western countries, though they have apparently been handed down for many generations, and are the result of innumerable experiments made without any knowledge of the chemistry involved."

It now appears probable, from the close agreement with the Mongolian methods, that they must be the result of very ancient experimenting; so that they were introduced into Japan as an already established practice 1100 years or more ago. Pumpelly observed at Yurap, in Yesso, lead smelting by a method closely similar to that of Hosokura, with a furnace charge of like character and amount, but with a chimney above the furnace. The bellows used there and at Hosokura is like that of Mongolia.

The work in the Hosokura mines in 1877 was merely gleaned from former rich workings that had reached to 120 and 128 feet below natural drainage, and that had been finally abandoned in 1872. In one mine the water was raised 120 feet with wooden pumps in three lifts by 540 men working in three eight-hour shifts of 180 each. Pumpelly describes mine bailing in the Chinese province of Chihli, just like the Mongolian, but says that the men bailing were blind men—a characteristically practical idea in that country.

The open cupel bottom at Hosokura was much smaller than Mr. Woo's Mongolian one and was only a foot in diameter, but two of them were used for the 150 pounds of lead produced the preceding day. The ashes were smoothed into a gentle hollow with a paper bag full of ashes flattened into a lenticular shape, with the ends of the paper gathered into a sort of handle on the upper side. At the last touch the very middle of the bottom was slightly pressed with the smoother. Over the cake of lead on the bottom, charcoal in pieces 8 or 12 inches long and 3 inches in diameter were set up in truncated-cone fashion and kindled by some live coals inside. At the end of about three hours the fire was removed and the lead sprinkled with water, cooled and separated from the litharge. One bottom was then reformed and all the now remaining lead placed upon it and treated in the same way for another three hours, and then cooled off as before. Then a smaller bottom, hardly 9 inches across, was formed, but with a depression in the middle $\frac{1}{2}$ inch deep and $1\frac{1}{2}$ inch across; and, under like treatment again, the brightening came in about two hours. The woman in charge quickly cooled the silver by blowing on it through a small bamboo tube; removed the cake of litharge, with the silver still red below, and poured on water. The silver button weighed about $1\frac{1}{2}$ ounce, troy. The second melting, it was said, made less litharge than usual, and, consequently, the third more in a longer time than usual, "because the ashes were bad." They are from any kind of wood, and are bought by weight from the country people, who are apt to mix loam and sand with them to increase the weight.

Mr. Woo's straightforward, clear paper is an earnest of much light that may be expected before long to be thrown upon many obscure oriental and archaeological matters by Chinese trained in western science, and, at the same time, otherwise well fitted and conveniently situated for such fascinating investigations.

The Randsburg Mining District Mapped.

A topographic map of the country adjacent to the Randsburg and Johannesburg mining districts, California, is now in press and will soon be issued by the United States Geological Survey. The area covered by this map is known as the Randsburg quadrangle, and embraces almost equal portions of Kern and San Bernardino counties, and shows part of the location of the Randsburg railroad, which connects Johannesburg with Barstow, San Bernardino county.

The scale of this map is approximately 1 mile to 1 inch. The contour vertical interval of 50 feet shows well the topographic features of the region. All roads, trails, mines and houses are shown with great exactness, and—most important in such an arid country—the positions of all wells, springs, reservoirs, and dry lakes are accurately located. This section is practically a desert, and unless water can be found within reasonable distances and at depths easily reached from the surface, prospectors and miners cannot prosecute their work. The water for Randsburg and Johannesburg is piped from wells about 5 miles northeast of these places. It is of fairly good quality but is insufficient in quantity, and while the water company charges are not there regarded as excessive, the lowest rates would as-

chemistry owes its origin to "those early devotees of the experimental philosophy who passed their lives among the fumes of the alembic." Those alchemists, however, may have more likely derived some of their leading ideas from the mysterious and at that time wholly unexplainable results observed in already very ancient metallurgical processes, in which, for example, certain stones were transmuted, as it were, into metals widely divergent in character from their ores, and even silver and gold were obtained from the most unlikely looking materials. It is, therefore, in any case, not improbable that the Chinese may have preceded western nations in the discovery of metallurgical methods.

At all events, it is now evident that the Japanese acquired these arts from China, the former source of all their higher civilization. My own observation of old fashioned silver smelting at Hosokura, on the main island of Japan, and about 220 miles northerly from Tokio, agrees so well with Mr. Woo's in Mongolia as to show the common origin of the methods, and that they have not probably changed in any important particular since the first opening of the Hosokura mines about 1100 years ago. The precipitation process was used there and was briefly noticed in my report on the second year (1877) of the survey of the oil lands of Japan, published at Tokio, in 1878, as follows:

"The galena is smelted in a small furnace or hearth (now only one), about $1\frac{1}{2}$ foot in diameter, with the addition of iron in the form of old coins. The charge is (in our pounds): 83 $\frac{1}{2}$ pounds of ore and the third

*Trans. Am. Inst. Min. Eng. Discussion of Y. T. Woo's paper.

tonish those who are not familiar with this desert country. Persons occupying houses or tents without water pipes usually pay \$1 a barrel for water.

The whole area represented on this sheet is one of the most forbidding deserts in the United States. The valleys are practically sand beds, the mountains bare masses of rock. The only vegetation in the valleys is scattered, low cactus, with here and there a greasewood or creosote hush about knee-high. The mountains are absolutely devoid of grass or trees.

The mineral wealth, principally gold, constitutes the whole value of the country; but this is sufficient to have built up during the last few years the flourishing mining camps of Randshurg and Johannesburg, with an aggregate population of about 1200.

Ore Treatment at Mt. Lyell.*

NUMBER II.

The method of metallurgical treatment has remained the same as at the start—i. e., direct pyritic smelting, with the use of only a very small percentage of carbonaceous fuel and with a heated blast, and subsequent bessemerizing after Manhes. The type and details of the blast furnaces have required no alteration from the original design. The use of a hot blast for the furnace treatment has been proved by experience to be obligatory and not to be circumvented, as indeed is demonstrated by a careful investigation of the thermo-chemistry of the method. The process, as a whole, is divided into three stages—i. e., two smeltings into matte and the converting of the enriched matte into blister copper.

The quantity of coke used in the blast furnace smelting, when calculated on the ore, is about 5% in current work for the twofold furnacing and 6% on the ore, including all incidental coke for blowing in purposes and similar occasional use, while on all the material fed into the furnaces, less coke itself, the percentage is only 3½ for the double smelting. It can hardly be maintained that so small an addition of coke has any vital bearing on the furnace reactions, from a heat point of view, and it is commonly remarked that the coke simply serves to keep the tuyeres from becoming too hard. It is fed along the long walls of the furnaces with this special object in view. Such low percentages of coke are only possible owing to the application of the oxygen of the atmosphere to the ore mixture under conditions which make the oxygen perform a function somewhat different in its effect from that which it exercises in ordinary blast furnace smelting, where a larger percentage of carbonaceous fuel is necessary. In all three stages of the process the material (ore or matte) is constantly subjected to an oxidizing action, and not a reducing one. The process, therefore, in this respect is the direct inverse of ordinary smelting operations in blast furnaces. A potent factor establishing the feasibility of the furnace smelting is the presence of a heavy percentage of iron and sulphur in the Mount Lyell pyrites, which elements yield a sufficient quantity of heat during their combustion or union with the oxygen of the atmosphere, to allow the solid products of combustion to remain in a superheated molten condition. This peculiarity also distinguishes the bessemerizing operation. In fact, it may be said that the Mount Lyell ore smelting is nothing more than a bessemerizing of ores, or matte therefrom, direct in blast furnaces, but so managed as to be continuous, and not intermittent, as is the bessemerizing operation, and also under perfect control, both as to the composition of slags and mattes and the proper mechanical separation of these two products. The company remains to this day the only instance of this idea being utilized on a large scale as the exclusive method of treatment. The entire length of time occupied by the transition of the copper in the ore from the latter into blister copper—i. e., from the moment the ore enters the first furnace until the blister copper issues from the converters—is only from five to six hours, if the time lost through cooling and transportation between apparatus is disregarded. An essential condition of success is rapidity of treatment, for it is only by this means that the necessary heat is concentrated to the required pitch.

The blast furnaces were blown in successively on the following dates: No. 1, June 25, 1896; No. 2, Oct. 6, 1896; No. 3, June 24, 1897; No. 4, Sept. 13, 1897; No. 5, Sept. 13, 1897; No. 6, May 26, 1898; No. 7, Oct. 3, 1898; No. 8, Oct. 18, 1898; No. 9, Jan. 26, 1899; No. 10, May 8, 1899; No. 11, June 29, 1899.

The blast furnace slags vary between the following limits of composition, the furnace charge for ore smelting and matte concentration differing somewhat from each other. Limestone is used only in the latter operation and not on the ore. The first matte is resmelted by itself, as a rule, i. e., very exceptionally has pyritic ore been used with it:

	Per cent.
Silica	36.66 to 41.70
Iron protoxide	50.67 to 43.14
Calcium oxide	1.20 to 8.16
Barium oxide	1.90 to 0.16
Alumina	7.47 to 5.46
Copper	0.25 to 0.35

The flue dust is ground up and mixed in a steam-driven mud mill with about 4% of common clay and the addition of a little water, and no lime is used for binding. The briquettes are of the size of ordinary bricks, are made by hand in preference to presses and weigh about fourteen pounds each. They are laid on shelves in a large drying room and rough dried by the heat of pots of slags ranged alongside. The quantity of flue dust so handled was 4666 tons for the year. Its average assay was: Copper, 3.5%; silver, 2.5 ounces; gold, 0.07 ounce. It contains about one-third silica, which comes from the dust and sand accompanying the quartz flux. More elaborate means of preparing the flue dust, like fusion in a reverberatory furnace, molding and burning in closed kilns, as well as a briquetting machine of good repute, have been given lengthy trials, but have all been discarded on account of being too expensive, and preference finally given to the present means, which is primitive in character, but more satisfactory in regard to cost and efficiency. The flue dust is partly oxidized, but there are not sufficient sulphates in it to act as binding material for machine briquetting, and the cost of the obligatory lime has decided against the method.

The system of getting rid of the slag by granulation has been in use since the start, but of late years it has become necessary to resort to mechanically raising the accumulating dump of each smelting plant to a higher level, to keep the talus of the dump within bounds. This is effected by centrifugal pumps of a special construction—the outcome of the simplification of prevalent types and adaptation to the special work to be performed. The pumps are at present steam driven, but will shortly be run by electricity. The slag pumps are of small diameter, 10-inch suction by 9-inch discharge, with 18-inch heaters or vanes, and are run at 540 to 600 revolutions per minute. The quantity of slag elevated during the year was 170,000 tons at No. 2 plant and 40,000 tons at No. 1 plant, together with all the water entering the two smelting plants, with the exception of that used for steam generation, sprinkling, etc. The respective lifts are 15 and 11 feet at present.

The new sampling works, which were erected in place of the original mill which was destroyed by fire a couple of years ago, treats the samples of all ores and mineral fluxes, also purchase ores used, and prepares them for the assay office. The proportions taken in transit and delivered to the sampling works are: Every twenty-fifth ropeway bucket of open-cut pyrites, every sixteenth truck underground ore, every eighteenth truck of mineral flux, while the proportion of purchase ores varies from all to one-quarter to one-eighth. The balance of lot goes direct to the furnaces; none of the ores, etc., are specially crushed, but are smelted in the size as broken at the mines.

CONVERTER PLANT. — The converting operations were conducted in conformity with the amount of matte produced by the blast furnaces. The bessemerizing plant is a double one, i. e., consists of two independent equal sized departments, each with facilities for turning out from twenty-five to forty tons of copper a day. The total number of vessels is fourteen (twelve in use), vessel stands, six; and there are two remelting furnaces with a No. 5 rotary blower each, with vertical engine attached; two high-class Allis-Chalmers' horizontal compound condensing blowing engines, 16 inches and 24 inches by 30 inches, with air cylinders 30 inches by 30 inches, delivering 3000 feet of free air at sixty revolutions; a 14-inch by 3½-inch by 10-inch by 10-inch duplex high-pressure pump; an accumulator; and all other necessary paraphernalia for the handling and tilting of the vessels, including hydraulic cars for shifting same, travelling crane, etc., together with the necessary machinery, grinding pans, etc., for the preparation of the vessel linings; also drilling machines for drilling the blister copper for sample. Steam is supplied by four 70 H. P. multipolar boilers. In the motive-power department the average indicated horse power developed for the year was 300, and the amount of wood fuel consumed 13,043 tons. The average blast pressure is eight pounds per square inch at the vessels.

This portion of the reduction works is also unique, for it is the only case of bessemer works for copper in Australasia. The first converter was started on continuous work on Jan. 14, 1897. The style of vessel is that known as the Stalman type, which has proved eminently satisfactory, and slight in repairs, to which latter fact the square shape of the vessels has essentially contributed. The tilting gear is extremely simple and effective, the rack being on the cylinder itself, which travels horizontally on the hollowed piston rod, through which the pressure water enters and leaves.

The clay for the vessel linings is a fine white variety of refractory nature, won in the immediate vicinity of the converter plant, and the silica is supplied by the screened fines or refuse from the quartz crushing plant at the quarries. In these important respects

the company is therefore fortunately situated. The composition of the clay is the following:

	Per Cent.
Silica	62.52
Alumina	23.89
Iron oxide	0.26
Calcium oxide	0.25
Magnesium oxide	0.40
Water and undetermined	12.68
Total	100.00

The number of "blows" which a lining will stand until corroded so thin that the vessel has to be removed is from five to seven.

The production of the bessemerizing plant for the four quarters of the year is given above, under the output of the furnaces in metals. Since the beginning of operations to the end of the company's last half-year (March 31) the total results are as follows: Blister copper, 40,168 tons, of an average assay per ton of—copper, 98.83%; silver, 81.36 ounces; gold, 3,124 ounces; containing—copper, 39,698 tons; silver, 3,268,016 ounces; gold, 125,498 ounces.

Adding on the production for the last quarter, the figures become the following, from the commencement of work to July 1, 1902: Blister copper, 42,060 tons; containing—copper, 41,568 tons; silver, 3,439,149 ounces; gold, 131,053 ounces.

The quantity of converter matte treated by the converters from the beginning to March 31 is 87,229 tons, of an average assay of—copper, 49.48%; silver, 39.34 ounces; gold, 1,480 ounces.

The blister copper is now poured into plates, or cakes, measuring 16x24 inches and 2½ inches thick, the former bars or pigs having been abandoned. Five hundred plates constitute a lot or parcel of fifty tons, the sample of which is kept distinct. Sampling is done by drilling two ½-inch holes through each plate, with power-driven drill presses. The blister copper is all shipped to the United States, via London, and is refined by the Baltimore C. S. & R. Co. in Maryland, on a toll arrangement, the products being turned over to the company. The products, i. e., electrolytic copper, as ingots, wire bars, etc., on the one hand, and fine silver and fine gold on the other, are sold by the company, the two precious metals being disposed of at the United States mints, and the copper in the open market. It is chiefly exported to Europe, its identity being merged in that of the brand, "B. E. R."

(TO BE CONTINUED.)

The American Negro for the Rand.

TO THE EDITOR:—I notice in to-day's issue of your paper a leader on "The American Negro for the Rand." I presume the letter I wrote to the Mining Journal (London, Eng.) was the cause or reason of your leader, as the quotation "two shillings per day and rations" was in the letter. I wish it to be understood that two shillings (i. e., fifty cents, approx.) per day and rations was the minimum wage to be offered—as this is, I believe, the minimum at present paid the natives. Furthermore, if you read the entire letter, you would have seen that I stated that the stockades would have to be replaced by bunk-houses for the single men and cottages for the married ones—it being taken for granted that these quarters were rent free.

Fifty cents a day with board and lodging is quite up to the average earnings of the colored people in the South. Another thing to take into consideration is that the work would be steady. Colored families would be able to do very well, as the girls could go into domestic service in Johannesburg and earn good wages. As I stated in the original letter, the entire success of the experiment would depend on how the first lot of emigrants were treated. The mine owners are beginning to "recommend the adoption of the expedient of Asiatic labor" but "not with a light heart," (see speech by Mr. George Alhur on April 15th at the meeting of the General Mining & Finance Corporation). The feelings of the majority of the workingmen (white) on the Rand were pretty clearly demonstrated at a recent meeting held Johannesburg to discuss the question—the only people present (viz., two) who were in favor of the importation of Chinese had to flee for their lives.

Oroville, Cal., May 9. RALPH L. MONTAGU.

A Word of Warning.

TO THE EDITOR:—Within the last four months, an individual well acquainted with the conditions of chemical laboratories of manufacturing plants, especially iron and steel works, is plundering the chemical laboratories in Virginia, West Virginia and now Ohio, of their platinum ware. We have had over a dozen of such robberies reported within the past four months, and from the way the thief goes about it clearly shows that he must have been a former iron chemist, thoroughly acquainted with the conditions of the chemical laboratories in the district mentioned. From what we now learn, he is now travelling up the Ohio river, getting into Pennsylvania, and a great service can be done by your valuable medium if you make these facts known, to put the chemists of iron, cement and steel, etc., works on their guard against him.

New York, May 9.

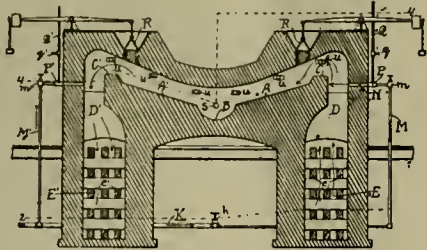
*From the report of the Secretary of Mines, Tasmania.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 5, 1903.

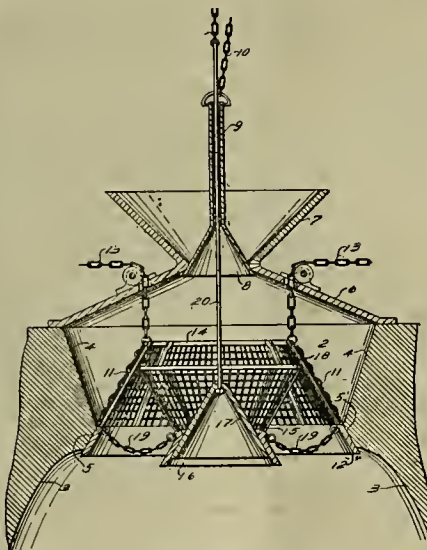
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

FURNACE FOR ROASTING AND SMELTING ORES.—No. 726,861; A. W. Catton, West Seattle, Wash.



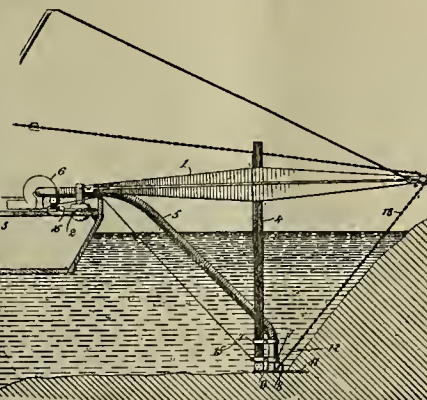
A furnace for roasting and smelting ore having hearths and central bullion well, hearths of furnace sloping toward central bullion well and having bridge walls at outer sides, top of furnace being curved above hearth and above flues leading upward from side superheating chambers to deflect and direct flames against ore on hearths, charging hoppers at point where flames are directed from flues to and over hearths, superheating chambers at each side of furnace, superheating flues leading from chambers and forming junction with smoke flue, pivoted gate damper at junction of flues to change draft alternately from one side of furnace to other, and steam nozzle within sleeve-shaped air intake discharging against gate damper and imparting forced draft to furnace.

BLAST FURNACE.—No. 726,893; N. Erzsig, Chicago, Ill.



In blast furnace, combination of smelting chamber having at upper end a feed chute; hell controlling chute; hopper-shaped screen secured within chamber below chute; second bell controlling discharge of material retained in screen; screen being vertically movable in chamber; means for raising and lowering screen; means for operating bells independently of each other and independently of position of screen.

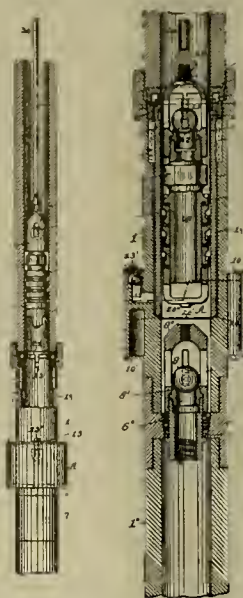
GOLD DREDGER.—No. 726,262; G. F. Barnes, Arcola, Ill.



In gold dredging machine, scow or float, crane having swinging connection therewith, boom supported by crane, suction pump on scow or float, suction tube leading therefrom and having its lower end con-

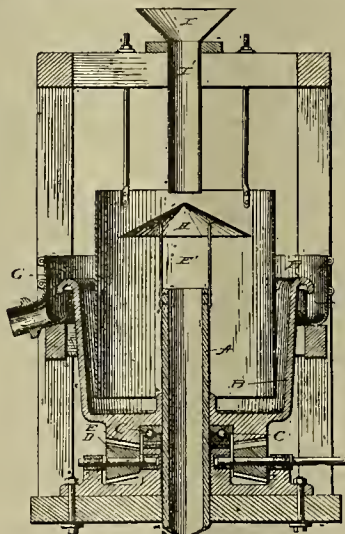
nected to boom, plate connected to lower end of boom and spaced from inlet of suction tube, means for causing movements of parts.

AGITATOR FOR OIL WELLS.—No. 726,899; A. B. Gahagan, Glade Mills, Pa.



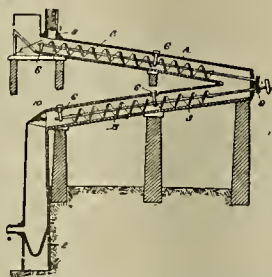
In agitator for oil wells, combination with working barrel, of coupling connected to working harrel and having receiving chamber surrounding same provided with sprayer jets leading therefrom, coupling having valve-controlled passageway therein communicating with receiving chamber, and revoluble means for opening and closing passageway.

CENTRIFUGAL ORE SEPARATOR.—No. 726,948; G. Land, Denver, Colo.



Ore separator, rotating bowl having axially arranged discharge pipe for valuable slimes depending through bottom of bowl and rotating therewith, deflecting hood secured to upper end of discharge pipe, annular deflector encircling hood and slime outlet pipe and terminating above bottom of bowl, and ore inlet pipe above hood and in line with outlet pipe.

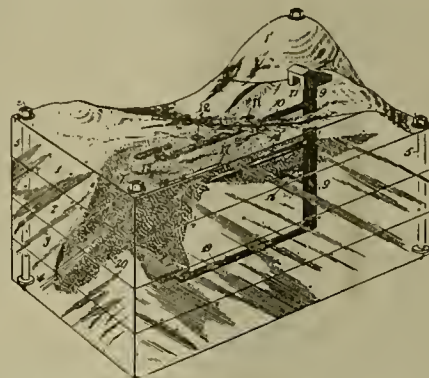
CALCINING FURNACE.—No. 726,915; C. T. Hennig, London, England.



Furnace of class described, combination of one or more interiorly horizontally flattened stationary chambers provided with internal conveying means with a vertical stationary empty chamber of considerable length and having an opening for admission of heated gases near lower end so that materials falling through may be exposed to action of heated gases rising through it, and having opening for discharge of materials at lower end below admission opening, flattened chamber or chambers being placed above

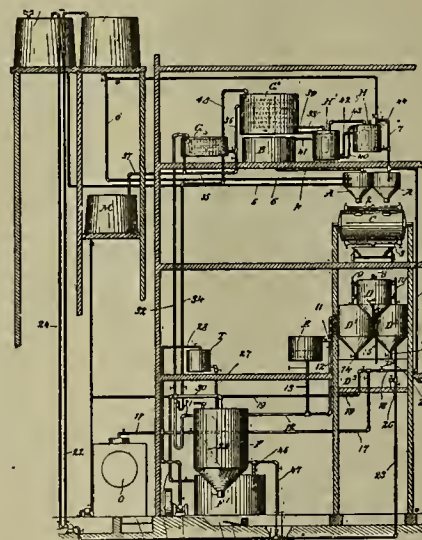
final chamber, all of the chambers being connected and so constructed that each successive chamber in series forms an angle with chamber preceding, first or uppermost chamber in series having openings for escape of gases and evaporations and admission of materials.

MINE MODEL OR EXHIBIT.—No. 726,140; N. P. Hill, Colorado Springs, Colo., and J. R. Chamberlin, New York, N. Y.



Transparent mine model or exhibit consisting of two or more plates of glass or transparent material suitably clamped together, upper plate or glass being ground or shaped to show superficial outline of land below which mine is located, plates being perforated vertically or at right angles to represent mine shaft or incline, and veins and dikes which traverse mine, and being provided with horizontal cuttings to illustrate drifts or tunnels at various levels below surface.

APPARATUS FOR TREATING ORES.—No. 727,362; H. Hirsching, San Francisco, Cal.



Ore treating apparatus including leaching vessel, settler, filter, still, lime still, tank containing condensing coil, absorption tank for vapors, stock solution tank, water tank, and boiler to supply heat to first mentioned still, so produced vapors from still being partially condensed in coil tank, and vapors not condensed therein being absorbed in absorption tank, parts being connected together by means of pipes.

PROCESS OF TREATING REBELLIOUS ORES OF THE RARE METALS.—No. 726,884; W. P. Downs, Jersey City, N. J.

Process of treating ores containing rare metals and rebellious elements consists in intimately mixing ore with sodium compound and agent capable of releasing metallic sodium therefrom, heating mixture to temperature sufficient to release sodium whereby combination of sodium with rebellious elements of ore results and leaves metal to be recovered distributed throughout mass, permitting volatile impurities and compounds to escape, recovering desired metal.

METHOD OF TREATING REFRACTORY ORES.—No. 726,184; R. McKnight and M. Satarasky, Philadelphia, Pa.

Consisting of roasting ore with access of air and agitation but shut off from products of combustion, until oxide of metalloid is formed and passes off, together with metal in ore in finely divided state, collecting fumes arising from ore, in receptacle containing solution of chloride of alkaline or alkaline-earth metal and converting in receptacle, oxide of metalloid into acid, and replacing hydrogen of acid with alkaline or alkaline-earth metal, setting free nascent chlorine, and forming a chloride therewith of metal values in finely divided state.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ARIZONA.

COCHISE COUNTY.

The Chicago & Arizona C. Co., with headquarters at Wilcox, has been organized, and has bought the Casey copper mine in Dos Cabezas district. T. B. Chattman, W. F. Nichols, P. B. Soto are the officers.

The Bisbee-Queen Dev. Co. has incorporated at Bisbee to operate twenty-four claims in Gold gulch, near the Calumet & Cochise group, 3½ miles southeast of Bisbee. The officers are B. F. Graham, R. I. Benton, J. E. Suits, J. H. McKim, W. L. Hargrove.

The Lake Portage & Bisbee Co. will increase development work on their mine, near Glance. Several cars of lumber are on the ground and a double drum hoist will be set up. A diamond drill will be used for prospecting the ground.

The Solomon Springs Con. C. Co.'s mines have been sold to Calumet, Mich., men and the first payment made. The property adjoins the Bisbee Con. and the Copper Glance in Glance district, near Bisbee.

W. Holmes of the Leadville M. Co., operating in the Dragoon mountains, 8 miles south of Pearce, says they have a body of copper ore averaging 12%. They have a group of eight claims, which are on a contact between porphyry and lime. There is also an iron dike running the entire length of the group, 100 feet wide.—The Great Western C. Co.'s group adjoins the Leadville on the south.

The Ivanhoe group of twelve claims have been sold to Michigan men for \$140,000 and first payment made. This group is between the Calumet & Cochise and Portage Lake & Bisbee, and is 2½ miles from Bisbee. The company is the Quincy & Arizona M. Co., organized last week at Hancock, Mich. J. Wilcox, J. Croze and E. L. Wright are officers.

GILA COUNTY.

The Troy-Manhattan C. Co. have seventy-five men on the payroll, most of them on development work on the Troy group of mines. Work was started last week on the Alice tunnel, which will be 1500 feet in length and tap the Alice lode at a depth of 700 feet. This tunnel will answer the double purpose of draining the mine of water and for the delivery of ore. A tramway will be built from the mouth of the tunnel to the site on the Gila river where it is proposed to place the smelter, says the Silver Belt.

In the Old Dominion Co.'s main four-compartment shaft sinking has been interrupted to cut a station at 130 feet, which will correspond with the third level in the old workings. The total depth of the shaft is 150 feet. Two steam hoists are used to facilitate shaft work. Grading the smelter site is expected to be finished next week. The smelter is making the usual output and shipments of copper and matte are being made regularly. The bins are full of coke and arrivals continue.

Work has been started on the fourth and sixth levels of the copper Hill mine, near Globe, and drifts are to be extended and several crosscuts run.

MOHAVE COUNTY.

(Special Correspondence).—The Minnesota mine, owned by the Philadelphia & Arizona M. Co., is doing little work this season.—The silver find by J. Carroll, between the Juno and Mormon Girl mines, showing up 2 feet of ore carrying good values in silver.—F. Tufty reports finding a quartz ledge carrying native silver, near the Gladstone mine, near the summit of Sherum's peak. This is also near the recent gold find made by J. Flynn, but on a parallel vein one fourth of a mile away.—At the Samoa mine, being worked by Hoffman Bros., a carload of ore is being gotten out that runs 2000 ounces silver per ton.

—R. J. Ferguson's negotiations for sale of Clyde and Redemption mines are still pending.—Another strike is reported in the Paymaster mine, near Mineral park, owned by J. Dunbar and J. C. Noble. Chloride, May 9.

The Gold Road M. Co., operating the Gold Road mine, near Kingman, will put in a number of gasoline engines at the mill and at the mine.

O. A. Pease, president of the Amalgamated G. M. Co. at Quartzite, says development work will be increased this summer on their gold and copper mines.

Material is on the ground for the narrow gauge railroad to be built by the Mohave G. M. Co. from their millsite, near Needles, Cal., to the Leland-Mitchell group of mines, a distance of 18 miles. ore cars will be built of steel, equipped with air brakes, and have a capacity of

seven tons. Work on the 40-stamp mill is progressing. Water for the use of the mill will be pumped from some of the lakes near the mill.

It is proposed to remove the mill at Mineral Park from its present location to the Keystone mine, where it will be remodeled and converted into a concentrating plant. J. Uncapher and J. Detar are the owners.

Ten miles from Chloride, M. Dempsey and W. O'Dea are opening up the ore body which they struck in their group of claims last week. They have a 10-inch shoot which assays \$100 per ton. The entire ledge is 40 feet wide.

PIMA COUNTY.

Work will begin next week on the Sam Hall group of mines, near Southern Bell, near Tucson. The ledges show free gold averaging \$7 per ton.

SANTA CRUZ COUNTY.

The Oro Fino Development Co. have taken over the Gold Rock Con. group and are refitting the mill building and will put in a cyanide plant.

YAVAPAI COUNTY.

(Special Correspondence).—Work is progressing on the mill being built by the Golden Link M. Co., at Hillside, under C. E. Bunker, constructing engineer. It is expected to have the plant in operation by June 20.

Hillside, May 10.

A hoisting plant will be put in at the Electra mine, south of Prescott, the main shaft of which will be sunk to a depth of 1000 feet. The ore carries \$15 gold and 10% copper per ton. There are 500 feet of development work.—Twelve men are at work on the Black Rock mine and grading for a 75-ton per day mill and a 52 H. P. hoist.—The Arizona G. M. Co. will put up a 22 H. P. hoist on its mine near Prescott, which has 600 feet of development work.—Adjoining the Keystone mine, the Golden Rule M. & E. Co. are developing some gold and copper claims. Mrs. L. Brill is president.—The Con. Angel M. Co., controlling the Angel and Bess mines, will put on men and develop the properties.—The Ryland lead and silver mine, near Wickenburg, Maricopa county, has been taken over by the Arizona M. & D. Co. It is thought the Wickenburg smelter will be moved down the river to handle the Ryland ore.

The Jerome Canyon Copper Co. are putting in a 40 H. P. compressor and a 50 H. P. hoist. Owing to an inflow of water in the lower workings, they will put in a sinking pump. The 200-foot crosscut from the 330-foot level to strike the ledge will be completed this week. Two machine drills are in operation.

The Mesa G. M. Co. have started work on a tunnel on its group of mines near Bigbug, near the Poland tunnel. The tunnel is in 90 feet and will be driven 300 feet to tap the Mesa ledge.

The shaft of the Chicago mine at Groom Creek has been timbered and sinking is in progress. It will go down 400 feet, giving a total depth of 550 feet. They expect to figure on a mill later on.

The Prescott Courier says a deposit of red rock has been located near Prescott, a sample of which is said to have given 20% aluminum. The rock is of a chalk-like consistency. The polished piece of red rock in the plaza fountain came from the deposit. [Without seeing a sample of this rock, it appears from its description to be the mineral heauxite, which is mined in Alabama, Arkansas and Georgia for its aluminum contents.—Ed.]

Manager J. F. Holden of the Coronado G. M. Co., says work began this week on their mines, 1 mile north of Congress.

The Monarch G. & C. M. Co., near Jerome, will resume work this month, and a shaft will be sunk to water level and a drift run into the El Capitan claim.

The Jerome Reporter says the McCall group of claims on Ash creek, near Jerome, is sold to Pennsylvania men for \$40,000.

CALIFORNIA.

AMADOR COUNTY.

The old mill at the Kennedy mine, near Jackson, was started up last week, making seventy stamps dropping in the two mills.

At the Zeila mine, near Jackson, the mill is running thirty of its forty stamps and the chlorination works are in operation.

At the South Eureka mine, near Sutter Creek, Superintendent J. Truscott says a body of pay gravel has been struck on the level recently opened and the 20-stamp mill will be started next week.

CALAVERAS COUNTY.

The Fannie Marie M. Co., operating near Mokelumne Hill, has taken on more men and work will be directed principally on the Bluejay mine, which is using electrical power.

At the Rooney gravel mine in Chili gulch, near Mokelumne Hill, bedrock has

been struck, with a showing of 9 feet of gravel which is reported to prospect well.

Operations continue on the Gumboots mine, near Esmeralda, says Manager E. H. Nutter. Grading is being done for additional machinery.

The 10-stamp mill on the Paragon mine, near Railroad Flat, is being moved to the Easy Bird mine, at Mokelumne Hill.

The mill on the Rose Rock mine at Murphys is expected to start up next week.

The Garibaldi mine has been bonded to Pueblo, Colo., men and development will begin by June 1.

The Golden mine, near Vallecita, will be reopened.

At the Orlole mine, near Angels, the mill is running steadily.

All work at the Carson Hill Con. mine, near Irvine, has been suspended.

Operations on the Boston quartz mine at Mokelumne Hill resumed last week. There is a 1000-foot shaft, but work was abandoned four years ago. Superintendent Burleson says that as soon as the workings are unwatered men will be put to work on development.

The Montana mine, on Salamander creek, near San Andreas, has resumed and new machinery is being put in, says Superintendent Thomason.

The Star of the East mine at Rich Gulch reports the vein cut at depth of 200 feet, showing 3½ feet of ore with a 4-inch pay streak. The walls are black slate.

EL DORADO COUNTY.

G. Nonguesser, owner of the Baltic mine, near Placerville, started his mill crushing ore last week.—G. Estey has bought the Edner gravel claim at Omo and has begun work hydraulicking. He also has men at work on the Whim mine.

E. P. Colgan, vice-president, and F. H. Hood, manager, of the Rio Vista Copper Co., have started work at their mine at Fairplay. Lumber for the plant and buildings and machinery are being hauled in.—Mott & Co. have men at work on the Alexandria mine near Placerville.

The Mt. Pleasant mine, near Grizzly Flat, is being unwatered.

B. McBeath, superintendent of the Monte M. & M. Co., says a 5-stamp mill and other machinery will be put in on the Del Monte quartz mine, Gold Hill district, near Placerville. A ditch from the river will bring water for power purposes. The Del Monte is a tunnel proposition and two tunnels have been run and a body of ore blocked out that assays in free gold values.

FRESNO COUNTY.

The California Oil Fields, Ltd., at Coalinga, brought in another producing well by finishing its No. 11 last week. This company has fourteen producing wells, with some bringing in as much as 800 barrels per day. Drilling has started on both Nos. 12 and 13.

At Coalinga work has been indefinitely suspended on the well of the Union Oil Co. on Section 24. The Caledonian Oil Co. has rigged up for its No. 2 well.

KERN COUNTY.

From all the Kern county fields during April the total oil shipments were 4200 cars.—The Fulton at Sunset is down 600 feet on their first well.—The West Shore Co. well, No. 8, is making a daily average of 300 barrels.—The Gilt Edge has abandoned its search for oil on the plains to the eastward of the proven bounds at Sunset. The drill was sent down to 1600 feet, but indications at that level did not warrant continuation of work, says the Reporter.

The Pearl Wedge, near Randsburg, had a milling at the Atkinson mill last week—nine and one-half tons netting \$90 per ton, says the Randsburg Miner.—E. Harris has taken a contract for a 150-foot tunnel on the May Queen at \$5 a foot. This mine adjoins the Minnehaha.—E. Hammond and S. Oakley have begun operations on the Orphan Girl.

G. A. Phillips and J. A. McDonald are leasing on the La Crosse mine in Stringer district, near Randsburg, and have struck ore. They expect to have a milling next week.—The Johannesburg G. M. Co. report a strike of high-grade ore on the St. Elmo group, near Johannesburg, and a 10-stamp mill will be built by July 1.

MARIPOSA COUNTY.

Fifty mining locations have been made in Mariposa county since March 1, the claims being mostly near Quartzburg and Coulterville.

At Whitlock the Austin Group M. & M. Co. are putting on more miners and increasing development work. Two shifts are working in the Golden Gate tunnel, another of the claims bonded by the company. It is intended to run a tunnel from the Golden Gate through the Coronado to connect with the shaft being sunk on the Ragan for a working tunnel and also to prospect the Ragan ledge. Through this tunnel the ore can be handled cheaper and brought closer to the mill.

MONTEREY COUNTY.

The Combined Oil Land Co. are drilling their first well near San Lucas and are down 100 feet.

NEVADA COUNTY.

At the Standard mine at Deadman's Flat, near Grass Valley, the hoisting works and steam plant are in operation.

At the Grass Valley Con. mine on Osborn hill, near Grass Valley, a shoot of ore has been opened up on the 800-foot level showing 20 inches wide, with pyrite, galena and free gold.

N. W. K. Schoorel, of the Rustlers' M. Co. of San Francisco, has a bond on the Junction mine at North San Juan and development work will begin this month. Machinery, including a rock breaker, concentrator and mill, will be put up at the mine, which adjoins the Boss mine. Electric power will be used. H. Huckins is superintendent.

At Mooney Flat, near North Bloomfield, the Pickley drift claim, which is being opened by Wheatland parties, a vertical shaft has been sunk 40 feet and the sump is in gold-bearing gravel that pays \$6 to the carload. A hoisting and pumping plant is being put in and the shaft will then be continued down to the bedrock, which is some 80 feet below the surface.

C. Stocks, superintendent of the Jenny Lind mine, has bonded the St. John's mine on Alta hill, near Grass Valley.

The Crystal Lake G. M. Co. has resumed at Meadow Lake, 8 miles from Cisco, Placer county, after a two weeks' shutdown, due to the pipe line being displaced by the heavy fall of snow, causing a lack of water. The mill was overhauled and the pipe line repaired.

A. West, operating on the Last Chance group of mines on Diamond creek, above Mayhert, says development is being increased and more men put to work. The 10-stamp mill is being put in running order.

PLACER COUNTY.

The Pingston mine, near Colfax, has closed down for an indefinite period.

Superintendent J. L. Grimes has men at work at the Herman mine, at Westville.

PLUMAS COUNTY.

H. D. Allert, secretary of the Continental M. Co. of Langdon, S. D., says the company has bought the Jones group of placer mines in McRea Ridge mining district, near Johnsville, J. M. Engle and B. L. Jones, the former owners, retaining a small interest, the latter acting as superintendent. The mines are 8 miles southwest of Johnsville, near the head of Nelson creek, and cover about 2 miles of the "blue lead" channel. The Continental M. Co. propose to fully equip and develop the group and will build three reservoirs for storage of water, and also a restraining dam. Water will be applied under 450 feet head. There are to be flumes and pipes for three monitors. An electric lighting plant will be put in. J. M. Engle of Quincy is Western representative.

SAN BENITO COUNTY.

Asbestos fiber of marketable quality is reported found on the property of the Bradford Quicksilver M. Co. at San Benito.

SANTA BARBARA COUNTY.

The Union Oil Co. has closed its options on the Burton, Dutard and California Bank interests in the Santa Rita, Purissima and Jesus Maria ranches, near Lompoc, which, with other contiguous lands recently bought, aggregate 100,000 acres, and development for oil will begin this month.

The Crocker-Woolworth Bank of San Francisco, owning the Alcatraz works and pipe line, pumping oil from the Western Union oil wells near Alcatraz Landing, have bought oil lands in Santa Rita region and drilling operations are expected to begin by June 1.

SHASTA COUNTY.

Development work began this week on a group of iron mines on McCloud river, near the plant of the McCloud River Power Co., and owned by R. J. Jennings of Portland, Or. The mines are 16 miles by road from Baird Spur.

Manager W. F. Snyder of the Western Exploration Co., operating the Balaklala mine at Kennet, says forty men are at work. Ore bins are being built and in these will be stored the output of the mine, running in copper, gold and silver, pending the construction of a smelter.

C. W. Crumh of the Redding G. & C. M. Co., owning the Four mile Bar Copper, the Cadum and Gold claims, on Clear creek, near Redding, says development will be increased. A crosscut tunnel has cut the ledge, which shows values in gold, copper and silver.

SIERRA COUNTY.

Since cutting the gravel channel of the Thistle shaft (Bellevue mine), near Ghosonville, two weeks ago, Manager C. B.

Wingate says they have driven to the 5420-foot point. It will be driven 60 feet more, and then the gravel will be opened up and extraction begun. An upraise to the surface, 600 feet, will be made for timber purposes. The tunnel is 8x8 feet, and it taps the channel in the Gib-enville Ridge at the lower end of the Bellevue Co.'s holdings. Higher up the ridge this channel was formerly worked through a shaft, but a water reservoir was tapped, the influx of which forced a suspension.

At the Plumbago mine, near Alleghany, in the lower tunnel at vertical depth of 800 feet, Superintendent Mather says the ledge has been opened up, averaging 4 feet in width. Arrangements are being made to start up the 20-stamp mill, which has been idle for some time. Work has started on running an upraise, which will connect with tunnel No. 3, 800 feet below. As tunnel No. 3 is connected with No. 2 this will allow of everything in the upper levels being taken through the lower tunnel and conveyed to the mill. Mather is also manager of the Oriental mine, near the Plumbago. A tunnel is being run at this mine, which will tap the ledge at depth.

SISKIYOU COUNTY.

Operations have begun at the Greenhorn blue gravel mine, a mile south of Yreka, with J. Garvey, superintendent. Four pumps are working unwatering the shafts and tunnels, which will be retimbered. Bedrock is at depth of 100 feet from the surface.

The Las Perlas mill in the valley of the Salmon river, near Somers Bar, is running steadily, and this summer the mill will be enlarged, a cyanide plant added and electric lights put in.

TRINITY COUNTY.

The Hoedoo mine, near the Enterprise mine, on the East Fork, near Coleridge, M. Manley manager, has been bonded to the company having an option of purchase on the latter mine, says the Trinity Journal.

TUOLUMNE COUNTY.

Superintendent Melghan of the Mount Jefferson mine at Groveland has interested Boston men in the development of deep gravel mines west of Columbia, and has secured bonds on the Brady and Shine placer ground, says the Magnet. Operations were begun this week.

Work is progressing at the Mt. Jefferson mine at Groveland and more men were put to work last week. Ore is being worked from the 200-foot to the 500-foot levels. At the 500-foot, east, drifting and stopping are under way. The gasoline engine and pump in the creek are supplying water for the batteries.

The Little Boy claim, near the Taranula, near Columbia, is sold to J. Moyle. The Manhattan mine has been sold to the Yankee Hill M. Co.

Another furnace is being built and an enlargement made to the chlorination plant at the Shawmut mine, near Chinese Camp.

E. E. Trefethen has bought the Cleveland, McKinley, Hoffman and New York placers, near Sonora. J. I. Raggio has bought the Golden Annie mine on the Tuolumne river, near the mouth of Big creek.

YUBA COUNTY.

Debris Commissioner W. W. Wagner says the Government barrier work at De Guerre Point on the Yuba river, near Marysville, reports construction will resume on Barrier No. 1, and that work on No. 2 will begin during the summer.

COLORADO.

BOULDER COUNTY.

A. M. Baker has resumed operations on the Elmora tunnel in Balarat gulch, near Wall Street. The tunnel is in 740 feet, leaving 120 feet yet to drive to cut the shaft.

The United Gold Mines, Drainage & Tunnel Co. (the Cash Carroll tunnel), near Caribou, is working steadily in the tunnel and expect to put in a compressor this month.

The Valley Forge G. M. Co., operating the Valley Forge mines near Salina, report a large amount of development work done the past six weeks, and men have been at work driving the main tunnel, which has cut the Fortune lode. As soon as they are through this lode they expect to open a body of smelting ore.

Hulet & Co. are working the Summit group of claims near Boulder and driving a tunnel. The lode on which the mine is located is being opened up, showing values of \$25 per ton. The group is being worked through tunnels which will cut the different lodes at depth of from 600 to 900 feet.

The Revenge Development Co., operating on Bryan mountain, in Grand Island mining district, 3 miles from Eldora, are driving their tunnel ahead by hand until the compressor plant is set up. The company owns thirty-one lode claims and tunnel and mill sites. Water power is devel-

oped from Middle Boulder creek, above which the tunnel starts. The tunnel will be driven south 2000 feet, following the iron sulphide vein, and then turn due west and run 4000 feet. A mill and compressor plant will be built at the mouth of the tunnel. J. V. Butch is superintendent.

The Copper Ranch G. M. & M. Co., near Wall Street, propose to build a mill at their mine this summer. Drifting is under way from the second level a distance of 210 feet from the shaft. The vein is 3 feet wide. There are several streaks of iron-copper sulphide, all of which show values. The ore averages \$20 per ton, says Manager W. Rogers. The company owns 170 acres of patented land.

The United States Gold Corporation, operating the Arapahoe group, an extension of the Fourth of July group, above Eldora, are doing development work on their ground. They are driving a tunnel 1500 feet into Caribou mountain to cut their veins at depth of 500 feet. In the course of this bore several veins of ore, and also an iron dike 18 feet wide, which carries values of \$8 per ton in gold, are expected to be opened. This summer a plant of machinery will be put in at the tunnel, power for which will be furnished by water. At present they are driving by hand. The company is composed of Boulder men.

I. M. Moore, operating the Quo Vadis tunnel near Salina, has a contract to drive the tunnel an additional 200 feet to cut the Portland vein.

Hulet & Co. are working the Summit group of claims near Wallstreet and are driving the tunnel into the mountain. The lode on which the mines are located is being opened up and values of \$25 per ton are obtained. The group is being worked through tunnels which are being driven so that they will cut different lodes at a depth ranging from 600 to 900 feet.

CLEAR CREEK COUNTY.

(Special Correspondence).—H. I. See, manager the Yankee Consolidated M. & T. Co., reports a strike in one of their properties. This company owns 100 claims, and has 10,000 feet of development work done. It is understood that contracts have been let for a railroad from Central City to connect with the property of this company at Yankee.

Yankee, May 9.

The shaft on the Last Chance lode on Silver creek, near Georgetown, 185 feet deep, has been unwatered and sinking resumed. The mine has been leased and bonded to a Chicago company, J. S. Stanish, manager.

Owing chiefly to the fact that a railroad will be built from Central City to Yankee, the latter place is the scene of considerable activity, say the reports. The Cumberland mines were bonded and leased last week for \$50,000 to W. R. Strosser of Denver, Kerr and Reuter of Cincinnati, Ohio. This company has been operating mines and mills in Idaho Springs for several years. The Cumberland mines comprise eight claims on the eastern slope of Yankee hill and near the Lombard mine. Work will begin next week and the shaft will be sunk deeper, drifts being run at every 100 feet in two directions on the vein. More machinery will be added. The Bully tunnel, near Yankee, has been leased to Denver parties, who will begin work this month. The Yankee Con. Co. have a hoisting plant and machinery for their new mill on the grounds. Twenty men are on construction work. The mill will be completed June 1, says Manager H. I. Seeman, and men will then be put in the Lombard mine. The '94 M. & M. Co. will begin work on their group next week. The mill will be remodeled, and cyanide treatment used in addition to the dry concentrating table.

Work on the mill of the Elkins M. & M. Co., operating the Terrible mine, near Silver Plume, is progressing. The mill is four stories high, and 100x80 feet. Some of the jigs are in place on the lower and second floors. Its capacity will be 200 tons of ore per day. The pipe line from the large dam is being built and is expected to be finished by May 15th. The company has ten machine drills running in the mine. The drift on the Terrible lode to connect with the bottom of the Dunderburg shaft is finished, affording ventilation and opening a passageway for the ores of the latter to the mill. Driving the west drift (the Brown lode) is progressing, and a streak of silver-lead ore has been cut, which is being stored in the mill bins. The main shaft has been unwatered to the eighth level by a 6-inch column with a 1-inch air pipe down the center of the larger pipe sunk 200 feet in the shaft, the water being forced to the shaft collar by air pressure. There are seven levels yet to unwater, then the shaft will be retimbered from top to bottom. B. C. Catren is superintendent.

In Empire Tunnel, at Georgetown, an average progress of 6 feet per day was made for the month of April, advancing

the bore 144 feet in twenty-four shifts in which the drills were run in the breast. Two shifts were employed, sinking a sump near the breast, and blasting out a shooting station, and work was suspended on two different Sundays during the month. The tunnel has reached the 2200-foot mark. A large porphyry dike was cut a couple of weeks ago, also a small lode on the north side of the dike, and more water has been met with since crossing this dike.

Operations were started last week on the Argentine and Creole claims on Leavenworth mountain, near Georgetown, by the Commercial Men's M. Co., recently organized in Chicago, Ill., with F. L. Miner manager. The claims adjoin the Colorado Central-Allende group. A tunnel which was started some years ago to cut the veins at a depth of 350 feet is being retimbered and will be continued.

CUSTER COUNTY.

It is reported the Vanderbilt mine, near Custer, has been bonded and leased to W. O. Murphy, of Kansas, who will begin development work next month. The main values are in silver, but it carries some gold.

DOLORES COUNTY.

R. Batchelor has a lease and bond on the Puzzle Extension mine, up Horse gulch, near Rico, and will begin development work by June 1.

The owners of the Mediterranean group of mines, in Allyn Gulch district, near Rico, are getting ready for operations during the coming summer. The ores carry values in lead and zinc.

G. A. Sanborn has a lease and bond on the Finis lode, also a lease and bond on the Minnie May mine, near Rico, and will work both properties this summer.

EAGLE COUNTY.

A. S. Little & Co., lessees on the Black Tiger mine, across the river from the California mine, in Eagle River canyon, near Red Cliff, are taking out ore which gives returns in copper, gold and silver. More men were put on last week. On another part of the Tiger, J. Johnson, who has a lease on the lower tunnel, is in good ore and has ten tons ready for shipment.

R. McMillan and L. Mathias, who have been leasing on the Red Cap, another canyon mine, were forced last week to abandon the mine on account of surface water, and a couple of days later secured a lease on the Alleghany, on South Battle mountain, and have since opened up ore.

FREMONT COUNTY.

The Ocean Wave coal mine at Williamsburg has been sold to the Rocky Mountain Fuel Co. at Denver for \$50,000. Included in the deal is 120 acres of coal land, bearing two strata of coal; a developed mine with a capacity of 200 tons a day, and all equipments. S. P. Smith, Jr., is superintendent. He still has charge of the Peanut mine at Williamsburg, and is sinking an air shaft on the edge of the town for better ventilation. Later the coal from the mine will be hoisted through this air shaft.

The United R. & R. Co., of Florence and Colorado Springs, are taking some of the machinery from the Metallic mine, near Florence, to Canon City, where it will be used in the construction of the smelter being built there by this company. A 3-inch vein of silver and gold ore is being developed near Grape creek in the Rocky Mountain Boy mine. Chicago men are interested and F. L. Pond is superintendent. The mine property is near the Green Mountain Boy and El Plomo claims.

The Portland Cement Co. near Florence are removing the kilns from the old mill to the new kiln room where they will be placed on concrete piers and run in connection with the four kilns in operation there, making six in all. The company intends converting the old mill department into a plaster of Paris factory.

GILPIN COUNTY.

Bad air has caused a suspension of operations in the breast of the Perigo tunnel at Perigo during the past week, says the Register-Call, but other operations continue, with sixty men on the contracting, day's pay and leasing systems. The Perigo mill is running steadily and is crushing 100 tons of ore per day. The Northwestern Colorado Exploration Co. has suspended operations at its Benton group on War Eagle hill, near Perigo, on account of the amount of water which the mine is making. The machinery has been found inadequate for present purposes and heavier pumps will be put in.

At the Freedom mine, near Central City, the Colorado-Tellurium G. M. Co. is retimbering the shaft from top to bottom. As soon as it is unwatered and the repairing finished it is intended to sink from present depth of 822 feet down to 1200 feet, where they are equipped for that depth. R. Borchardt is superintendent.

Operations have been delayed at the Snowden Con. group in Pine Creek sec-

tion, near Central City, on account of the bad condition of the roads. The owners have 150 tons of smelting ores in their ore bins ready to ship to the smelters.

The Belden mine in Chase gulch, near Central City, is being unwatered. Eastern parties are interested, and since taking hold last fall they have repaired and retimbered the shaft to depth of 400 feet. Below the 400-foot point the shaft has good walls.

Arrangements are being made for the starting up of the Pleasant View group on Gunnell hill, near Central City, and a steam plant has been put in. The property is owned by E. Reser of New York City, J. J. Joslin of Denver, et al.

GUNNISON COUNTY.

The Ruby-Anthracte coal mines, near Crested Butte, have resumed and expect to begin shipping coal next week.

HINSDALE COUNTY.

(Special Correspondence).—Creel Bros., who have a bond and lease on the Excelsior mine at Capital City have opened up a body of ore in a winze 90 feet below the tunnel level and have a shipment ready. The ore is a sulphide carrying values in silver, lead and copper, with an excess of iron, and averages \$50 per ton. The Golden Fleece will resume work next week in their crosscut tunnel. The mill is being overhauled preparatory to reworking the tailings. A number of lessees are working in the upper levels. Somerich pockets of tellurides are found. The Pelican group, up Henson creek near Lake City, which is under bond and lease to a Boston company, has men at work on development. Some ore is being saved, a streak 14 inches wide showing in the breast which assays \$55. J. D. Kaysar is superintendent. The Hanna M. Co., owners of the Moro and Ajax claims near Capital City, expect to put on forty men next week. The mill will be remodeled, and magnetic separators put in. This ore is heavy in zinc, which has caused excessive treatment charges at the smelters, and prevented shipping of concentrates. It is reported the Yellow Medicine mine at Capitol City will resume, and the mill which was built in sections moved down near the creek, making it more accessible to the lower tunnel. The North Star, above Lake City, under bond to Cochran, Barrett & Patterson, report a body of galena and they are getting a carload ready to ship. The snow is still 2 feet deep in Burrows Park, so there is no prospecting being done yet in that section. Several mines, however, are doing development work, including the Bon Homme, Dupre and Pennsylvania.

Lake City, May 19.

LAKE COUNTY.

During the past year Leadville has shipped in actual tonnage of zinc sulphides 85,699 tons, which yielded \$2,000,000. During the same time Leadville's output of lead ores has been \$1,500,000, a curious economic change resulting from the advances in milling practice, says the News-Dispatch.

A larger pump has been put in at the Coronado mine at Leadville on the 600-foot station. This pump has a capacity of 1000 gallons for 1000 feet.

The Brazil M. Co. has incorporated at Denver; T. R. Woodrow, J. W. Jackson and W. R. Milburn and Berger Bros., to operate near Leadville and also in Wyoming.

LA PLATA COUNTY.

The Animas river will be used as initial power for generating electricity to be distributed over a large area of the San Juan country. A company has organized for this purpose and the building of the first plant will be begun near the Baker bridge, 15 miles north of Durango, this month. Other plants will be erected from time to time farther up the river. The fall of the river from Silverton in a distance of 44 miles to Durango is 3000 feet, and its volume varies. Overtures have been made by the company for the purchase of the plant of the Durango Light & Power Co., says the Gazette.

MINERAL COUNTY.

W. G. Boyle, F. Nash and R. B. Wallace, of Creede, have a 1000-foot contract to drive the F. M. B. tunnel near Creede that distance. F. Nash, superintendent, has fourteen miners and machine men at work.

SAN JUAN COUNTY.

T. J. Hurley, superintendent of the Natalie Occidental group, near Silverton, says the Magnolia vein has been opened up, showing 14 feet between walls and carrying average values of \$9 per ton in gold, copper, lead and silver. It has been decided to put up a mill during the coming summer.

All sales on the New York - Brooklyn group, near Silverton, are declared off by the owners and the mining of ore and further development will be done this year by Manion Bros. & Murphy. T. Manion, manager, has been given a lease

on the Johnson mill at Burro Bridge, North Mineral, for experimental purposes on the lower grade ores of the mine. Shipments of the richer gold ore will begin as soon as the Red Mountain railroad is opened up.

D. Heindel and D. Pettyjohn have begun work on their Mszepa group of four claims in Ice Lake basin, near Silverton. The ore is a lead sulphide and gives returns of thirty-four ounces silver, a little gold and 20% lead.

The Fisher mill and millsite and the Eveline group of five claims near Silverton, of the Eveline M. Co., of Denver, have been sold to the Venetian M. Co., of Chicago, Ill., for \$15,500. The main purpose of the Venetian Co. was to secure the water right on Cement creek and to obtain deep entry to Peacock veins on Peacock mountain through a drive along the Eveline vein. The mouth of this tunnel is near Henrietta switch on the Gladstone railroad. For the present, ore will be hauled to the Fisher mill. It is expected the mill will be moved to near the tunnel, and enlarged.

SOUTH ARAPAHOE COUNTY.

(Special Correspondence).—For the past eighteen months some of the leading oil operators of Colorado have been investigating the oil possibilities of Bijou Basin, near Deer Trail and Byers, 50 miles east of Denver. Indications of oil and gas have been found in artesian wells. The territory is perhaps 50 miles in length by 10 to 15 miles in width. A Peoria, Ill., company are building a derrick and will begin drilling at Peoria, half way between Byers and Deer Trail.

Peoria, May 9.

SUMMIT COUNTY.

The placer mining season has opened around Breckenridge. All the larger placer properties, the Oro Grande, American, Gold Pan and French Gulch, have begun washing gravel. The Oro Grande's 11-mile ditch has been cleaned of snow, ice and debris, and Manager Harris has started work with both elevators. Manager G. H. Evans of the Gold Pan has started the elevators on the company's placers. The elevators are draining the pit and washing of gravel will begin by next week.

TELLER COUNTY.

The Fort Pitt Co., operating on the Sunshine claim on Galena hill, near Cripple Creek, has straightened, enlarged and retimbered the shaft, and the shaft will be sunk on the vein an additional 100 feet before drifts are run out on the ore body. Sinking has been resumed by the South End Leasing Co., operating on the south end of Burns' claim of the Acacia M. Co., at Cripple Creek, the company having stope out the ground between the surface and the bottom level at depth of 80 feet.

Kinzy & Co., operating the Sitting Bull claim of the Keystone Co under lease, have secured the Pannick claim of the same company and adjoining the Sitting Bull claim near Cripple Creek. The lessees evidently think that the ore shoot will extend over into that property. It is intended to put a plant of machinery on the Pannick and start development this month. Shipments of ore are being maintained from the Sitting Bull.

With the opening of the Rocky Mountain mine, on Beacon hill, Cripple Creek, everything on the west slope of that hill is working. The Rocky Mountain Co. has leased the group for two years at a flat royalty of 20% to A. C. Adams. The shaft is to be sunk an additional 100 feet and it is his intention to put in a plant of machinery, including an air compressor. The shaft is down 200 feet.

Sinking continues on the middle block of the Deadshot, on Rosebud hill, Cripple Creek, and O. H. Satterlee, lessee, is down 80 feet. When 100 feet is reached a steam hoist will be put in. C. Perkins, operating under lease the Compromise Fraction and the Deadwood claims, is installing a steam plant of machinery.

At Victor the Economic reduction plant in Aregua gulch is handling 200 tons daily, the ore coming mainly from mines owned by the Woods Investment Co., which also owns a controlling interest in the Economic mill. Pot Gulch district, 4 miles south of Victor, is reviving, says the Telegraph. New York men have erected a plant of machinery and development is being done at depth of 300 feet. A cross-cut is being driven on a vein of quartz 40 feet wide, which returns average values of \$5 per ton in gold, says Manager Degnon, of New York.

The holdings of the Cripple Creek & Colorado Co., (the Rittenhouse) on Gold hill, Cripple Creek, are being leased out by Manager O. B. Finn. A lease on the north 400 feet of the White Elephant claim, from the surface down to the depth of 300 feet, to J. C. McSparrin; north block of the Happy Day claim to C. Johnson from surface down to depth of 300 feet; R. G. Mullen south half of the White

Elephant claim. All the leases are for eighteen months and flat royalty of 25% on all ore shipped. The property is equipped with a plant of machinery and the shaft is down 800 feet.

Another ore shoot has been added to the system of ore shoots of the El Paso Con. Co. at Cripple Creek, says the Cripple Creek Times. The shoot was found toward the eastern part of their ground and was cut while driving the level toward the water course. With this find the El Paso Co. claims to have seven separate and distinct ore shoots. The production from the mine during April amounted to 1073 tons of the usual grade of ore. In the first level of the new shaft at depths of 190 feet and 220 feet below the surface they have opened the extension of the C. K. & N. vein, the ore showing 4 feet in width and averaging \$40 per ton in gold. The company has finished setting up another battery of boilers. The water is being controlled—that is, as far as the company cares to handle it at the present time.

The ten sets of lessees operating on the mines of the Work Co. at Cripple Creek, both on Raven and Gold hills, are shipping an average of 125 tons of ore each month, all of which will average \$20 per ton in gold.

The total production from the Vindicator mine at Victor for April was 1500 tons of an average grade of \$35.

The tramway at the Portland mine at Cripple Creek is in operation, carrying waste rock from No. 2 shaft to the dumping area on the west side of the mine. The tramway works automatically in disposing of the rock and is driven by an electric motor. Its length is 800 feet.

The Practical Leasing Co., operating on the Trachyte of the United G. M. Co., produced 800 tons of ore during April, of a value of \$30 a ton. The output would have been heavier but for the large amount of dead work done during the month.

The Cripple Creek M. Co., leasing on the Hull City Placer main workings, is shipping two cars per day, averaging \$40 a ton. The shaft is down to the 1250-foot point and the station is being cut, after which a crosscut will be run to the ore body.

The output from the Golden Cycle last month totaled 3700 tons, of which lessees Dalzell & Wilson shipped 600 tons and the rest was mined on company account. The value of the output was \$25 a ton.

IDAHO.

BLAINE COUNTY.

The Minnie Moore M. Co., near Hailey, has resumed regular shipments of ore from its mine.

BOISE COUNTY.

The Idaho World says the Lincoln mill at Pearl and the Overlook mill at Neal will be compelled to shut down because of a clause in the "pure food law" enacted by the last Legislature which prohibits the sale of oil and gasoline less than 150° proof. Both these mills have gasoline engines, and gasoline used for power purposes is less than 72° proof.

IDAHO COUNTY.

J. B. Eldridge of Topeka, Kans., has bought the Waterhouse & Churchill group of three claims on Smith creek in Thunder mountain district, near Roosevelt, for \$3000. The claims adjoin the group owned by the Kansas & Texas Oil Co., of which Eldridge is manager. They also own the Independence group in the same district, on which work has been in progress all winter. As soon as sufficient ore is stope and blocked out a cyanide plant will be put up.

C. L. Hathaway says he will have fifty men at work on his placer ground on Grouse creek, near Council (Washington county), this season.

OWYHEE COUNTY.

Manager Gerling of the Homestake group, near Silver City, says next week they will begin running a tunnel to crosscut the ledge at a depth of 300 feet. The tunnel will be 400 feet long.

SHOSHONE COUNTY.

The New Jersey G. M. Co. will build a 10-stamp mill, electric lighting plant and a tramway this summer, construction work beginning June 1. It is the intention of the company to increase the plant to forty stamps if the present mill proves satisfactory. The mines of the New Jersey G. M. Co. are 3 miles east of Wardner, between Gold Run and Big creek, on the line of the O. R. & N., says J. H. Tilley of Spokane, Wash., a director. The company is completing a flume 8300 feet long, which will bring water for running the mill.

Manager Goodrich of the Highland Chief mine, on Pine creek, near Wallace, says the company will put up a sawmill and a four-drill air compressor, the sawmill to cut timber for the flume which will have to be built. These improve-

ments are preliminary to putting up a concentrator.

D. M. Hyman, manager of a group of mines at Aspen, Colo., says operations will be resumed at the mines of the Gem Con. M. Co., near Wallace, of which he is also manager. These mines have been closed down and concentrator hung up since last fall.

Savage & Chrysler, principal owners of a placer group extending the entire length of Beaver creek, near Wallace, will build two dredgers on their grounds this season. Two dredgers are already in operation. The first work this season will be done on dredger No. 3, the estimated cost being \$65,000. The first two floats cost \$45,000 each, but the third is to be larger. Lumber for No. 4 is on the ground.

Spring placer operations have started around Pierce. The Rich Hill Co. began piping last week. It is expected the pumping plant will be on the ground and ready to run by June 10th.—L. C. Roberts, manager of the Musselshell group, has men at work. He says it will take \$25,000 to open up and equip their placer property ready for operation.—The Fidelity Co. on French creek is working fourteen men, running two giants.—Several quartz mines that were shut down for the winter are starting up.

WASHINGTON COUNTY.

Manager G. W. McDowell of the Con. Copper M. Co., operating at Mineral, reports making a strike in the tunnel which is being driven. The ledge shows 42 feet wide and carries values in silver and copper. He has sixty-five men at work and two machine drills in operation. They have an eight-drill air compressor. The smelter has been overhauled, but will not be put in operation until July 1, as Manager McDowell says he does not expect to stope out ore until then.

MICHIGAN.

The lake and rail rate on refined copper from lake ports to New York is 23 cents per 100 pounds, as compared with the all-rail rate of 41½ cents.

HOUGHTON COUNTY.

The work of sinking a shaft began this week at the Globe mine, near Houghton, on the lode found by experimental drilling last summer, says the News.

The April product of the Franklin mine, near Hancock, amounted to 361 tons as compared with 317 tons for April, 1902.

The new Hecla mill, near Calumet, is running all five heads of stamps electrically. Lake advices say that Calumet & Hecla copper is costing 8 cents a pound and sales have recently been made at 15½ cents. They are stamping 6000 tons of rock per day, from which, comparing with last year's figures of production in refined copper, the yield is forty-five pounds of mineral per ton stamped. It is only a few years since the yield was sixty pounds. The mine is shipping more rock than at any previous period, which is made possible by the recent improvements in the hoisting equipment.

The April product of the Adventure mine, near Redridge, amounted to 181 tons.

It is reported that a plan is on foot by President Fay and members of the Union Land & M. Co. for the organization of a new company which shall take the northern portion of the Seneca group and 400 acres of the Union Copper Land & M. Co. property immediately north thereof, near Houghton.

Rock shipments from the Cbamption show a gradual increase, and now aggregate 1400 tons daily. The milling plant is saving a mineral yield of forty barrels of fine copper per day.

MONTANA.

BEAVERHEAD COUNTY.

Superintendent O. Mast says foundations are being made for the smelter at the Indian Queen mine, on Birch creek, near Dillon, which is owned by Butte men. The smelter will have a capacity of thirty tons daily.

CASCADE COUNTY.

D. M. Sutton of Helena says a new gold field has been discovered 7 miles south of Belt and near the coal camp. The ores are similar to those of Kendall district and can be treated by cyanide.

CHOTEAU COUNTY.

E. W. King at Landusky is having a mill put up at his mine, and he expects to have it in operation by July 1.

FERGUS COUNTY.

The Mountain King, Big Pine, Broken Leg and North Pole claims, north of and adjacent to the Abbey group, near Kendall, have been bonded to the Case-Wilson Cyanide G. M. Co. of Trenton, N. J., for \$40,000.

C. A. Case has bonded the Big Chicago claim in Cone Butte district, near Lewiston. Several hundred dollars worth of development work has been done on the

property, a great deal of it by parties who have attempted to jump the claim, says the Argus. There is a 60-foot shaft and a 20-foot crosscut all in ore which assays \$10, and can be treated by cyanide.

At the Drake mine of the Gold Reef group in Gilt Edge, instead of one roaster as originally decided upon, two are to be put in and work on them is being rapidly rushed. They will have a roasting capacity of 300 tons daily. A mill is also to be put up on the dump and the tailings will be worked over.

GRANITE COUNTY.

Manager F. D. Brown says operations have resumed at the Basin Gulch placer mines and he has seventeen men at work. The indications are that there will be a good supply of water for placer mining purposes this summer.

D. Conklin, superintendent of the Billy Maddox mine at Royal, says owing to snow in that section and the difficulty of obtaining supplies work has been practically suspended temporarily at the mine. The roads are in bad condition and will probably be for the next two weeks.

JEFFERSON COUNTY.

The new feature about the Heinze mill at Basin is the flume built to remove the tailings from the mill to the dumping ground. The tailings had piled up in the creek to such an extent that it not only annoyed the ranchers of Boulder valley, but also proved an inconvenience to the company. The plan is to dump the slimes and retain them in the dam built for that purpose, and so avoid running the tailings down the stream and through ranches in the valley, where there is danger to the growth of vegetation and the poisoning of stock. The company in order to avoid any trouble with the ranchers, has built a dam east of the mill to stop the flow beyond the company property and will build it higher as occasion demands.

M. L. Hewitt, manager of the Cateract C. M. Co. at Basin, says he has put on more men at the Bullion mine to further develop the property, and will also put in additional machinery.

The Bertha mine at Corbin is being developed by the Helena & Livingston M. & R. Co.—The Tyler group of claims, 2 miles from Montana City, has been bonded to Jones & Martin of Great Falls for \$100,000, and men have been put on development work.—The Liverpool and Washington mines in Lumpguch, near Boulder, are to be tested to see if the high-grade silver ore bodies of that district go down, and the shaft will be sunk to the 800 level, where they will crosscut to the lead.—The Rose G. M. Co., incorporated under New Jersey laws, has filed in the office of the Secretary of the State a certified copy of its articles of appointment of an agent in Montana, the agent being B. F. Maiden of Bozeman. The company owns eight mining claims and two millsites in this county. B. P. Mason began work on the Virginia Bell group last week above the Boulder-Wickes tunnel, 6 miles north of Boulder.

LEWIS AND CLARKE COUNTY.

Plans are being prepared for a stamp mill and cyanide plant for the Plegan mine, near Marysville. The plant will be similar to that of the Belmont mine, owned by the Longmads, and the tailings will be treated before leaving the mill. Development work on the Plegan progresses and the plant will be built at the mouth of the main tunnel.

MISSOULA COUNTY.

Negotiations are reported in progress in Copper Cliff district by F. T. Homer and W. B. Tilden of Baltimore, Md., for the bonding of the Copper Cliff mine. The Copper Cliff district is 25 miles east of Missoula. Copper values have been found by prospectors and also ores that run in both gold and silver.

NEVADA.

HUMBOLDT COUNTY.

B. F. Caffey et al. have bought the Black Bird mine, near Winnemucca, for \$20,000, renaming it the Bluejay. The vein carries average values of \$12 per ton in gold. A. Garr is superintendent.

The smelter of the Glasgow & Western Exploration Co. at Golconda is expected to blow in again next week.

LINCOLN COUNTY.

At Bamberger's DeLamar mines the mill is expected to be in operation this week. The plant by which 2800 H. P. is to be supplied the mines and mill was given a preliminary run last week. Superintendent Janney has 100 men at work underground.

NYE COUNTY.

Sinking began last week on the Ordah-Tonopah group of seven claims southwest of the Tonopah Central and 1½ miles south of Tonopah, says Manager Watson. A hoist will be put in.

At the Mizpah at Tonopah the west drift on the 600 level is in 140 feet and in

a body of ore. Winzes are being sunk every 250 feet from the 300-foot level to connect with the 400-foot and 500-foot levels, and the 400-foot level is being extended to connect with the winzes. In the east 300-foot level, 900 feet from the Slebert shaft and 300 feet from the east end of the Mizpah, a winze is being sunk on the ledge and is down 60 feet. This ledge is 80 feet wide and averages \$40 a ton.

J. C. Gladden last week bought seven claims adjoining the Lynch & O'Meara group at Alpine, near Tonopah, and C. E. Hudson, F. Lathrap, J. W. Langley and M. L. Eflinger of Salt Lake City, Utah, and A. L. Hudgins of Tonopah have incorporated to develop the group. Work will begin next week. A shaft will be sunk within 400 feet of the present workings of the Lynch & O'Meara.

The Tonopah-Albamarle M. Co. began development work this week. Its property consists of twelve claims on the eastern base of Mount Oddie, between the Mizpah Extension and the Butte-Tonopah Co.'s mines, near Tonopah.

Foundations are being made east of the Midway hoist for the 10-stamp mill of the Tonopah M., M. & D. Co. at Tonopah.

STOREY COUNTY.

The Butters Co. has amoled the Hale & Norcross waste dumps at Virginia City, which will be hauled to the cyanide plant in Six Mile canyon.

Manager J. Ryan's report for the week ending May 9 says the work of repairing and overhauling the engine and hoisting machinery continues at the Con. California & Virginia at Virginia City. The south drift on the 1800-foot level is repaired, but no work is being done on other levels. The pumps are holding the water below the 2150-foot level. The Hale & Norcross tunnel was advanced 17 feet, total length 3639 feet. The face is in hard porphyry with a strong seepage of water. At the Utah the work of installing the electric hoist is completed and awaiting connection with the Truckee River General Electric Co.'s line. Some changes and repairs have been made to the machinery of the drill plant at the Occidental mine, and drill hole No. 4 will be started next week. At the Silver Hill they took out during the week 117 cars of ore from different parts of the mine, samples assaying \$17.57 in gold and two ounces silver. A 1 H. P. motor has been put in on the 200 foot level for running a blower. On May 4 men began to work eight-hour shifts in the Overman and Caledonia mines.

WASHOE COUNTY.

The Wedekind mill, near Reno, which has been idle since February, started up this week on Tonopah ore.

The Cabin No. 2 mine, the V mine and the Wadsworth mill, in Olinghouse canyon, near Wadsworth, have been sold to New York men, says the Wadsworth Dispatch. It is thought the Slip mine and mill and the Renegade mine may be included in the deal.

WHITE PINE COUNTY.

The Old Imperial M. Co. at Cherry Creek are building a mill at their mines, says the Cherry Creek Miner.

Superintendent Leishman of the Wide West M. Co. says a body of free gold ore has been opened up on the 150-foot level of the Wide West mine in Gold Canyon district, near Cherry Creek.

NEW MEXICO.

OTERO COUNTY.

At Jarilla the Jarilla C. Co. are working on the 300-foot level and taking out ore. The Orion Co. are driving a crosscut through its 30-foot ledge.

SIERRA COUNTY.

W. S. Henderson of Colorado Springs, Colo., has bonded the Grand Central mine, near Lake valley, and will begin development work this month. A sawmill will be put up at the mine and a wagon road built to Lake valley. The mine contains a body of ore with values in lead, silver and zinc.

OREGON.

BAKER COUNTY.

Excavations are under way for the 10-stamp mill for the Octo mine, near Sumpter, says Manager Patterson. The sawmill is in operation and development work in the mine continues.

Manager W. L. Vinson of the Emma mine, near Baker, has put in a 12 H. P. hoist and a 16 H. P. engine for his mill. The hoist is put in the tunnel 300 feet from the portal and at a point where the ore is showing best, it being intended to sink on this ore body.

Superintendent D. McCoy has twenty men at work on the Olive Creek placers, near Baker. He is operating three giants, the two larger ones being in Three Cent, where the gravel bank has a depth of 30 feet, while the No. 2 is in the main chan-

nel of the Olive, where the depth is 6 feet.

J. R. Cunningham of the Advance and Storm King companies, near Sumpter, says the ore is showing the full width of the shaft in the bottom at the Storm King, and a concentrating mill will be built.

J. Waddell, operating the Cyclone mine near Baker City, has put in a 25 H. P. gasoline hoist for sinking from the tunnel. The tunnel is in 200 feet, but there are other workings on the property proving the vein.

Manager A. Mohr says work was resumed last week on the St. Joe mine, near Sumpter—putting two shifts in the cross-cut tunnel which is being driven to cut the Jack Pot vein, which it is expected to reach 40 feet ahead.

GRANT COUNTY.

J. W. Burch, part owner of the Independence group, near Granite, has let a contract to G. J. Barrett for driving 400 feet of tunnel.

Work on the Scandia tunnel, near Alamo, continues steadily, says B. Wade, superintendent, and 2250 feet is in.

JOSEPHINE COUNTY.

The Kramer-Palmer quartz mill on Mt. Reuben, near Grant's Pass, is in operation. The mill is of four stamps, run by water power, and the ore free-milling. An impounding dam has been constructed to catch the tailings. The mine is on the Rogue river side of Mt. Reuben, near the mouth of Whiskey creek.

WALLOWA COUNTY.

Manager G. A. Nebrhood of the Imnaha smelter, being built by the Eureka M. & S. Co. at Imnaha, says he has fifty men at work. All machinery for the 300-ton plant was shipped via Lewiston, from which point it is being transported by steamer on the Snake river to the smelter on the Imnaha river, near its junction with the Snake. Mr. Nebrhood says development work in the mines of the company have reached that point where an output of 200 tons a day is assured. Five tunnels have been driven, each an average distance of 200 feet, opening up a body of copper sulphide with depth. On one of these, the Mountain Chief, the vein with smelting ore is 9 feet wide. The steep banks of the Snake and Imnaha where the copper is found afford splendid tunnel propositions, and the Eureka Co. is able to drive on its veins from both the Imnaha and Snake sides of the divide. Water for power is obtained from the Imnaha. It is expected the Eureka smelter will be finished by Sept. 1.

SOUTH DAKOTA.

LAWRENCE COUNTY.

President Pratt of the Wauconda M. Co. has a bond on a group of mines on Elk creek, 5 miles south of Lead. There are 450 acres in the group, and it is to sell for \$250 an acre. The group is between the Wauconda and Anaconda groups, and includes the water right of the Hall ranch on Elk creek.

The Anaconda G. M. Co. have put in machinery at the shaft near Elk creek, and sinking is resumed in the shaft. The ore is free milling.

UTAH.

BEAVER COUNTY.

Manager P. T. Farnsworth of the Horn Silver mine, near Frisco, says a 200-ton shipment of zinc ore is being made from that property to Antwerp, Belgium. It is the initial shipment from the State. The ore carries 40% zinc and it is estimated there are 300,000 tons of it in the old workings. It is a trial shipment.

Secretary L. G. Brown of the Erie mine, near Millford, says the company has put in a 22 H. P. gasoline hoist at the mine. The main shaft is down 261 feet and has cut through 60 feet of red oxide and native copper. The ore shows small values in gold and lead. Contracts have been let for sinking the main working shaft 50 feet deeper and also to run a drift from the 250-foot station.

President F. Sugden of the Blue Jay Extension Co., operating in Indian Peak district, near Millford, says a gasoline hoist will be put in.

IRON COUNTY.

Denver, Colo., and New York men have an option on the Rice group of claims, north of the Johnny mine, at Stateline, for \$30,000 for two years. W. F. Baker, of Denver, Colo., manager, says a double-compartment shaft will be sunk and machinery put in. The Rice group consists of eight claims.

JUAB COUNTY.

A shoot of ore was cut 65 feet below the 1000-foot level in the Lower Mammoth shaft at Eureka last week. The ore sampled showed assays of sixty ounces silver. The shaft is going down at the rate of 4 feet a day, and is 10 feet below the 1000-foot level. This shoot will not be pro-

spected till drifts are run from the 1200-foot point.

The Fairview group of claims, between the Ajax and the Victor and adjoining both properties, is to be incorporated next month, and developed through the Sioux-Ajax tunnel, a drift from which will cut the ore zone 1100 feet from the surface, says Manager E. O'Brien, of Mammoth. J. O'Brien and H. Kelly, of Scranton, Pa., are part owners.

Two shifts are at work on the ground of the McKinley M. Co., near Eureka, with J. L. Anderson as superintendent. The ground is northwest of and adjoining the Centennial-Eureka. The 250 foot tunnel will be extended another 200 feet to tap an ore body which was opened up in a shaft above.

MILLARD COUNTY.

The Ozark Gravel G. M. Co. has incorporated at Desert; A. Campbell, J. M. Evans, T. M. Evans, F. E. Hoagland and L. Van Hecke, says the Desert News.

SALT LAKE COUNTY.

To supply the needs of the valley smelters during April the producers furnished 97,234 tons of ore, while it is estimated 20,000 tons were forwarded to plants of the American S. & R. Co. outside the State. While bad roads in the gulches and between the mines and the leading stations along the railway curtailed the actual amount of ore forwarded from the diggings somewhat, the smelters had, of course, their bins, in which is always contained a surplus on which to rely, and the run was continuous throughout the month. It is expected the May reduction will exceed 100,000 tons.

SANPETE COUNTY.

C. C. Parker of Eureka, manager of the New York M. Co., is putting up a mill at the company mine west of Ephraim.

SEVIER COUNTY.

S. F. Mount and L. Nielson are reopening the L. & N. mine near Richfield, which Mount has under bond and lease.

SUMMIT COUNTY.

The Portland-Park M. Co. has been organized at Park City: M. C. Harrington, J. H. Steele, M. Sommer, A. H. Fuelling, J. V. Murphy, M. L. Garity, W. Wirthlin.

Operations will begin this month on the mill to be built by the Kearns-Keith Co. at Park City. The plant will be at the mouth of the Hanauer tunnel, through which the Kearns-Keith and the Keystone mines are to be worked, says the Record.

Two additional rolls have been put in at the zinc plant at Park City.

The Ingersoll group at Park City was sold last week to J. Mortz and M. Cullen of Salt Lake City, and development work will be started next week.

R. Gorlinski has a lease and bond on the St. Louis-Vasser ground in Snake Creek district, near Park City, for \$80,000. It is intended to put in additional machinery.

TOOELE COUNTY.

A battery of three retorts with which to treat the mercurial ores of the Sacramento M. Co., at Mercur, is being built and the production of quicksilver will begin June 1st, says Manager Bothwell. J. H. Magee will be superintendent. The rock has maintained an average of 10% mercury with \$8 gold per ton, says Bothwell, the principle being to collect the former through volatilization and to leach the gold from the residue as is done with the main gold-bearing ores. The production of quicksilver has been accomplished at Mercur before, but never on a commercial scale.

UTAH COUNTY.

C. W. Earl, W. H. Greenwood et al., have bonded and leased the Whirlwind group of five claims near American Fork. This group adjoins the Dutchman mine on the west and the Goodsell and Pacific on the south.

WASHINGTON.

CHELAN COUNTY.

T. S. Burgoyne of Spokane, part owner of the Horseshoe Basin M. & Dev. Co., which owns five claims in Horseshoe basin in Stehekin mining district, 25 miles from the head of Lake Chelan, says a number of open cuts have been driven on the ledge. They are also driving a tunnel and must go 300 feet farther before the ledge is struck, which will be tapped at depth of 500 feet. The ledge is 4 feet wide and carries gold, silver and lead values. The company will put in electric drills. There are no other claims working in the district, says Burgoyne. The Cascade G. & C. M. Co. of Ashland, Ohio, owns claims adjoining the Horseshoe on the same ledge.

FERRY COUNTY.

Superintendent W. G. Madison of the Bodie mine, near Republic, says he is putting in a gasoline engine and blower. The Trade Dollar mine has put men to work

stopping ore for shipment to the Tacoma smelter.

Work has resumed on the Washington mine, near Hall's bridge, 7 miles north of Orient. F. Ward and C. E. Brooks are the principal owners.

D. F. Anderson of Rosalia, manager of the Belcher mine, near Republic, says the tunnel has cut the ledge for 31 feet and has not yet reached the foot wall. The ore assays \$30, chiefly in gold. He says there is a large amount of ore on the dump and shipping will begin July 1. The mine is 7 miles from the railroad, but has a good wagon road.

KING COUNTY.

The Renton Coal Co., whose mines are 5 miles from Seattle, report iron sulphides in their coal which assay \$7 in gold.

WYOMING.

CARBON COUNTY.

A strike is reported from Big Creek district, near Saratoga, by the Gibraltar M. Co. in its group near the Cox mine. A 4-foot vein of covellite has been opened up at depth of 160 feet.

FOREIGN.

BRITISH COLUMBIA.

The annual report of Manager J. H. Mackenzie of Le Roi No 2 Co. at Rossland shows the sales of matte amounted to \$385,521. The mine was operated only 263 days. The ore mined and shipped to the Northport smelter was 155,765 dry tons, averaging .363 of an ounce of gold; .709 of an ounce of silver and 1.526% copper. The cost of mining and smelting was reduced during the year, although a large amount paid for exploration work was charged in the accounts. The costs per ton for 1901 and 1902 are shown in the following table:

	1901.	1902
Stopping and loading on railroad.....	\$ 3.487	\$ 3.100
Exploration.....	.423	.451
Deoreclation:		
Mine equipment.....	.080	.138
Surface improvements..	.050	.061
Mine machinery.....	.106	.125
Freight on ore to smelter.	.510	.400
Smelter expense.....	4.465	4.205
Depreciated smelter plant.	.232	.119
Interest and discount on ore in yard and matte in transit.....	.229	.233
Freight on matte to refiners.....	.536	.404
Sacking and crushing matte.....	.044	.043
Eastern representation, assaying, etc. ....	.028	.013
Refiners' tolls and deductions.....	.534	.579
Metal losses in smelting...	....	.781
Total.....	\$10.724	\$10.652

The total development work done during the year was 3123 feet. The cost of shaft sinking per lineal foot was \$106.99; of crosscutting, \$ 8.92, and of drifting, \$16.95. The expenditures as reported by the manager include \$487,010 for mining ore and \$106,887 for construction, development and additions to mining machinery and plant.

There are 1000 men at work at the coal mines of the Crow's Nest Pass Coal Co., at Michel. The rock for the new coke ovens at Michel is being brought from the quarry at the rate of seven cars per day and construction work has begun.

Manager A. Banks of a company operating on Perry creek, near Fort Steele, says the placer mining season in that district is well under way.—The Kootenay Perry Creek M. Co. have bought a tract of gold-bearing gravel on Perry creek suitable for dredging, and have their machine in operation.

The Nanaimo quarries, from which the stone for the San Francisco Mint was cut thirty years ago, and have since been idle, will be reopened, says Manager Emery, under a lease from the Western Fuel Co. of San Francisco. Stone is wanted for building purposes in all the coast cities. Hundreds of men will be employed and a fleet of vessels engaged.

W. H. Tibbals of Salt Lake City, Utah, has an option on a group of claims near Greenwood, for \$135,000.

At Trail three copper furnaces are running, with an ample supply of coke and ore. None of the lead stacks have been blown in. The supply of lead ores is as yet light.

The miners in Dunsmuir's Cumberland coal mines, on Vancouver island, struck on the 4th inst., because several union leaders were discharged. The real issue is the recognition of the Western Federation of Miners. It is thought the Cumberland mines will not be closed down absolutely, as the Extension mines have been, but an attempt will be made to work them with Chinese, Japanese and non-union men. If effective, the strike will cut off the fuel supply of the Canadian

Pacific Railway, leaving the Nanaimo mines the only producers on the island. The double strike at Extension and Cumberland affects 2000 men.

Several changes have been made in the tariff laws of Canada, one provision in particular which is of importance to Cariboo miners: "That machinery and appliances, of a kind not made in Canada, for exclusive use in alluvial gold mining, be added to the free list until June 30, 1904."

The Spitzee mine, near Rossland, has resumed. A contract will be let for 100 feet of sinking on the site selected for the new headworks and compressor plant. The new main shaft will be two-compartment, sunk at an angle of 70°. At the 100-foot level a drift will be driven north to connect with the old workings.

In Boundary district connection was made last week between No. 3 tunnel and the 100-foot level on the old Ironsides mine near Greenwood. This tunnel is on line with and will ultimately be connected with the 200-foot level of the Knob Hill mine. The Snowshoe mine began shipments this week.

The second furnace at the B. C. Copper Co. smelter, Greenwood, was blown in this week, notwithstanding that coke is not yet coming sufficiently freely to keep both furnaces supplied. The company, however, had a reserve of 1500 tons of coke when the works were shut down in February, and this is being drawn on, the expectation being that the Crow's Nest Coal Co. will shortly send in larger supplies. The Montreal & Boston C. Co. blew in one furnace this week and a second one will be started as soon as coke supplies are sufficient to run two furnaces.

COSTA RICA.

W. Macgregor of Berkeley, Cal., mining engineer for the Abangarez Goldfields, Ltd., of New York, operating the Abangarez concessions in Guanacaste district, says they have put up two mills, one of twenty stamps and one of ten. The principal values are in gold, averaging \$16 per ton, and in connection with the mills Macgregor has introduced the cyanide process there, by which their principal extraction of gold is obtained.

KLONDIKE.

Dawson advises say the sluicing season began April 27, and the washing of the dumps on all the Klondike creeks is well under way. An official statement from the Governor of the Territory says it is not the intention to establish an assay and gold purchasing office at Dawson, as none is needed. Last year the creeks in this district produced \$12,000,000 in gold. Duncan creek, it is said, is proving a good producer, and will add to the output for the season of 1903. Sulphur, Bear and Gold Bottom creeks have been greatly revived this spring. On Dominion 29 miles are being worked with success.

MEXICO.

SONORA.

The Nogales, Ariz., Oasis says the Big Mountain M. Co. is planning to increase operations at its Planchas de Plata group, 10 miles south of the International line and the Oro Blanco district of Arizona. The plans include a 250-ton mill, wire tramways, air compressors and machine drills, and an electric light plant.

E. Miller of California and son, C. A. Miller, are operating their mines at Baviacora, 100 miles north of Hermosillo, the San Carlos group, the rock running \$80 gold per ton. They also have silver-bearing ore. They are putting up a 50-ton cyanide plant and a 20-stamp mill, which they expect to have in operation by August 1. They have plenty of wood and an ample water right at the mines.

Manager H. C. Glore of the Washington & Sonora C. M. Co., operating east of Puerto on the Sonora railway, last week let a contract for sinking a shaft upon one of the ore bodies. He is also consulting engineer of the Sevilliana mine near Willard station, near Nogales, Ariz., owned by H. Prickett of Douglass, which is being reopened.

F. Garretson of Buffalo, N. Y., has a working bond on the Promontorio copper mine, 25 miles east of Hermosillo. He has also bonded adjoining properties from other parties.

La Cananea men have located 30 pertenencias of ground near Sonora river in Picacho district. The ledge is 20 feet wide and assays show values in gold and silver. The country rock is porphyritic. The claims are 7 miles east of Cananea. The survey of the new Yaqui River road runs within 1½ mile of the discovery shaft.

W. G. Campbell of Detroit, Mich., has taken up placer gold mining ground near Llano, in the southeast part of Ures district, near Soyopa, and is preparing for hydraulicking.

Four thousand pertenencias (10,000 acres) of placer ground have been taken over by F. E. Monteverde & Co. on the Yaqui river, below the ground of the Chi-

cago & Sonora M. Co. and extending to Camaripa. A drilling machine will be used to prospect the ground.

A strike is reported in the Golfo del Oro group on the Yaqui river, being made in La Cobriza mine, showing the vein 4 feet wide, assaying \$100. The ore shows free gold. Through this section three railroads are planned and all three surveys cross the Golfo del Oro property, says Manager Grover. The Golfo del Oro Co. is composed of Colorado Springs, Colo., men—J. K. Brunner, Grover, et al.

Superintendent De Camp of the Lucky Tiger mine south of Douglas, Ariz., says he put on last week 200 Yaqui Indians at work in the mine, in addition to the 100 men already on the payroll. The gold ore is carried overland to Turracachi, a station on the Nacozari railroad, 30 miles from the mine. Several carloads are on the ground at Turracachi, and it is the intention of the company to ship a trainload to the El Paso smelters by June 1.

The Nogales Oasis says D. P. Pinelli has organized a company to work the La Esmeralda mine near Moreno.

TAMAULIPAS.

Tampico reports say there are six distinct companies, including the Pan-American Co., mining for asphalt between that place and Tuxpan. The Pan-American Co. has put in a plant near Tamiahua lake, north of Tuxpan, which will have a capacity of producing several hundred tons of refined asphalt daily. Other companies are prospecting around the town of Chapopote (the native name for crude asphalt).

SOUTH AFRICA.

TRANSVAAL.

London advices say the Rand gold output for April is estimated at 230,000 ounces, an increase of 12,500 ounces over March. The production in April, 1902, was 119,589 ounces.

PERSONAL.

D. LANYON, a mining man of Australia, is in San Francisco, Cal.

E. BARTON HACK of Denver, Colo., is in Chicago for a short stay.

W. S. BROWN of Con. Mercur Co., Mercur, Utah, is at their mines.

F. L. SMITH of Denver has returned there from Los Angeles, Cal.

A. J. OREM of Salt Lake City, Utah, is in the East on mining business.

M. BRINN, a mine owner of Sutter Creek, Cal., is in San Francisco, Cal.

R. M. GREEN, a mine owner of Oroville, Cal., is in San Francisco, Cal., on business.

F. J. SIEBERT, interested in mines at Tonopah, Nev., is in San Francisco, Cal.

E. F. FRENDETHAL, manager of the Manhattan mine of Pioche, Nev., is in the East.

W. W. BELL of Bradford, Pa., has returned there from a trip through the West.

B. McDONALD, E. M., of Spokane, Wash., is in Rossland, B. C., examining mines.

W. H. BRAY, a mine owner of Nevada City, Cal., is in San Francisco, Cal., on business.

J. F. HOLDEN of Chicago, Ill., is manager of the Coronado G. M. Co., near Congress, Ariz.

D. S. FISH has resigned as superintendent Esperanza Oil Co. at Coalinga, Fresno county, Cal.

W. W. BRYNE of Salt Lake City, Utah, is examining mines in Neal and Pearl district, Idaho.

J. C. LYNCH of the Daly-West and Thompson Cos. of Park City, Utah, is in Chicago, Ill.

H. HUCKINS is superintendent of the Junction mine at North San Juan, Nevada Co., Cal.

C. A. CANFIELD, interested in oil properties in southern California, is in San Francisco, Cal.

F. SUTTON, a mine owner of Sonora, Tuolumne Co., Cal., is in San Francisco, Cal., on business.

H. W. SHERMAN of Salt Lake City, Utah, is in the East in the interest of the East Pacific M. Co.

A. DE CHAMPAGNE, interested in mines at Weaverville, Trinity Co., Cal., is in San Francisco, Cal.

T. AISHTON, interested in mining properties in Australia and the Orient, is in San Francisco, Cal.

H. G. VERCOE, superintendent Fresno copper mines, has returned to the mines from San Francisco, Cal.

P. S. COULDREY, general manager of the Le Roi No. 2 Mines, Ltd., returned to Rossland, B. C., last week.

W. E. BORAH returned last week to Salt Lake City, Utah, from an examination of mines at Elko, Nev.

F. P. SWINDLER, formerly with the De Lamar mines, is manager of the Duplex mines at Searchlight, Nev.

A. BUCKBEE, manager of the Virtue Con. mines, near Baker City, Or., is visiting at Salt Lake City, Utah.

S. P. SMITH, JR., is superintendent of the Ocean Wave coal mines at Williamsburg, Fremont county, Colo.

F. R. CLEARY is superintendent Caribou and Sauer Dough oil companies at Coalinga, Fresno county, Cal.

H. E. VAIL has resigned as metallurgist of the Shawmut mine, near Chinese Camp, Tuolumne county, Cal.

R. J. KING of Hanford, Cal., is superintendent Esperanza Oil Co. at Coalinga, Cal., vice D. S. Fish, resigned.

H. B. VERCOE, managing director Fresno Copper Co., Ltd., of California, has gone to London, England.

R. CHAUVENET has returned to Denver from Lake county, Colo., where he has been examining mining properties.

M. L. HEWETT, manager Cataract C. M. Co., at Basin, Mont., returned last week from a six months' trip East.

W. J. CASEY is superintendent of the Republic Con. G. M. Co. at Republic, Wash., vice J. Bresnahan, resigned.

MANAGER F. WILSON of the Lucy L. and Copper Belt Cos. of Deep Creek district, Utah, is in the East on business.

J. H. KNOWLES is superintendent of the Burns group of copper mines, 25 miles from San Simon, Cochise county, Ariz.

B. T. LLOYD of Salt Lake City, Utah, manager of the Copper Mountain mine of Beaver county, Utah, is in Chicago, Ill.

H. T. POWER, manager of the Hidden Treasure G. M. Co. at Sunny South, Placer Co., Cal., is in San Francisco, Cal.

J. H. MAGEE is superintendent of the quicksilver retorting plant being built by the Sacramento M. Co. at Mercur, Utah.

E. W. KING of Lewiston, Mont., owning mines near Landusky, Mont., has returned from a business trip to Chicago, Ill.

R. BLACKSTONE, formerly chief engineer Homestake mine, Lead, S. D., is assistant superintendent under T. J. Grier.

W. B. AKERS of Spokane, Wash., interested in the Coronado G. M. Co., operating near Congress, Ariz., is at their mines.

G. N. PORTER is metallurgist of the Shawmut mine, near Chinese Camp, Tuolumne county, Cal., vice H. E. Vail, resigned.

E. A. WILTSEE, consulting engineer Venture Corporation of London, England, is visiting the principal mining camps of Mexico.

G. BLACKWELL of Murray, Idaho, has gone to Libby, Mont., to take charge of the A. K. M. M. Co.'s mill in West Fisher district.

C. D. VAN DUZER, manager of the Lone Mountain M. & D. Co., near Tonopah, Nev., is in New York on company business.

MANAGER HERRON of the Tomboy G. M. Co., Ltd., returned last week to Telluride, Colo., from a business trip to New York.

C. K. MCCORMICK returned last week to Salt Lake City, Utah, from an examination of mines at Gold Roads, Mobave county, Ariz.

C. E. CADY, interested in mines in Tonto district, near Globe, Ariz., has gone to Colorado Springs, Colo., for a protracted stay.

PRESIDENT S. BAMBERGER AND SUPERINTENDENT F. P. JANNEY of Bamberger's De Lamar mines are at De Lamar, Nev.

W. F. DETERT, president of the Argonaut G. M. Co., and superintendent of the Zella mine at Jackson, Cal., is in San Francisco, Cal.

O. A. PEASE, president of the Amalgamated G. M. Co. of Mohave county, Ariz., returned last week from a month's business trip in the East.

F. J. GREISBERG has resigned as electrical engineer for the Standard Con. M.

Co. at Bodie, Mono Co., Cal., and goes to San Francisco, Cal., June 1st.

T. VAN METER of Weiser, Idaho, is superintendent of the United Gold Ledge M. Co., operating in Thunder Mountain district, near Roosevelt, Idaho.

W. B. MUCKLOW of Hartford, Conn., was elected president of the Majestic C. M. & S. Co., operating near Milford, Utah, vice A. B. Lewis, retiring.

A. E. KLAUSER of Toledo, Ohio, president Yaqui S. & R. Co., operating at Toledo, east of Sonora, Mexico, is in Mexico looking after mining interests.

B. McBEATE, superintendent of the Monte M. & M. Co., Gold Hill district, near Placerville, El Dorado county, Cal., is in San Francisco, Cal., on business.

J. A. McINTIRE of Sacramento, Cal., owner of the South Keystone mine, between Amador City and Sutter Creek, Amador Co., is in San Francisco, Cal.

E. H. BENJAMIN, E. M., of San Francisco, Cal., is at the Golden Eagle mine of the Hayden Hill M. Co., Lassen county, Cal., of which he is consulting engineer.

W. F. SNYDER, manager of the Western Exploration Co., operating the Balaklala copper mines at Kennet, Stbasta county, Cal., is at Kennet from Salt Lake City, Utah.

D. L. GREGG, for a number of years connected with the Mine & Smelter Supply Co. of Denver, Colo., has been appointed manager of their El Paso, Texas, branch house.

MANAGER G. H. EVANS of the Gold Pan placers, near Breckenridge, Colo., returned last week from an extended trip, having visited San Francisco, Cal., Mexico and New York.

P. WILLIAMS of Salt Lake City, Utah, will take charge of the Silver Belle properties at Red Rock, Pima county, Ariz., where the owners propose putting up a 300-ton smelter.

R. F. HOLDEN, managing director of the United States M. Co., operating at Bingham and Eureka, Utah, returned to Salt Lake City, Utah, last week from a business trip East.

J. M. DIKEMAN, former superintendent Red Boy mine, near Sumpter, Or., has gone to South Africa as consulting engineer for the United Rhodesia Gold Fields Co., operating in Rhodesia.

J. BRESNAHAN, has resigned as superintendent of the Republic Con. G. M. Co. at Republic, Wash., and will resume traveling and examining mining properties for P. Clark & Co. of Spokane, Wash.

H. H. CLAUDET, technical representative of the Canadian Ore Concentration Co., operating the Elmore process at Rossland, B. C., returned last week from a business trip to San Francisco, Cal.

PRESIDENT AGASSIZ, VICE-PRESIDENT LIVERMORE AND CONSULTING ENGINEER LEAVITT of the Calumet & Hecla mines at Calumet, Mich., are at the property on their usual spring visit.

J. WAUGH has resigned the superintendency of the C. P. R. lime quarry at Fife, B. C., being succeeded by P. M. Stewart. Mr. Waugh has gone to Winnipeg to engage in business for himself.

B. J. GLEASON, formerly of Deadwood, South Dakota, is acting superintendent of the Old Dominion mine, near Colville, Stevens county, Wash., vice M. McCarty, who is in California for an extended stay.

H. COLBATH, for a number of years assayer and metallurgist for the Con. Mercur Co. at Mercur, Utah, has resigned to accept a similar position at Bamberger's De Lamar mines and mills at De Lamar.

B. KADISH, owner and manager of the Baker City Sampling Works at Baker City, Or., has gone to New York, and will sail June 1 for an extended European tour, during which his address will be Vienna, Austria.

J. E. SPURR, geologist in charge of the U. S. Geological Survey of Tonopah district, Nev., has returned to Tonopah to complete the field work which he was forced to suspend last fall on account of the snow.

A. B. LEWIS AND W. A. FARISH returned to Salt Lake City, Utah, last week from attending the annual meeting of the Majestic C. Co. at Denver, Colo., and were accompanied by H. M. Holbrook of Boston, Mass., of the same company.

J. AND T. HOATSON, P. Ruppe, H. Hill, C. Briggs and J. Mauser of Calumet, Mich., and G. L. Tenner and J. Oliver of Pittsburgh, Pa., have returned from a visit to the mines of the Calumet & Arizona M. Co., near Douglas, Ariz., in which they are interested.

Obituary.

J. DELANEY, pioneer miner and prospector, died at Juneau, Alaska, May 1. Deceased was 64 years of age and a native of Ireland.

W. H. DEWEY, an Idaho mine owner, died at his home in Nampa, Idaho, May 8. He was one of the pioneers of Owyhee county and was the locator of the Trade Dollar mine near Silver City. He was also interested in the Dewey mine in Thunder Mountain district.

R. M. HARTMANN, Ph.D., professor of chemistry in the Colorado School of Mines at Golden, Colo., died May 8, and C. D. Test, an instructor in the same branch, is in a serious condition as the result of asphyxiation by fumes of sulphuric acid in the experiment room while endeavoring to repair the machinery by which the acid is made.

W. P. SCOTT, general manager and part owner of the Black Oak mine, near Soudbyville, Tuolumne county, Cal., died in Oakland, Cal., on the 6th inst., after a lingering illness. A combination of ailments caused death. Deceased was connected with the Black Oak mine for a number of years. He leaves a wife and two step-children, besides three brothers, one being W. G. Scott, superintendent of the Black Oak mine.

A. SAHLBERG, formerly of Butte, Mont., a mine owner at El Oro, Mexico, died May 6 at El Oro. Sahlberg went to El Oro ten years ago from Montana and took a position as shift boss in a mine owned by G. Frisbie. He observed that the vein in the Frisbie mine ran north, resigned his job as shift boss and located a prospect adjoining the Frisbie, on which he struck the vein of what is now the Esperanza. Deceased was a native of Denmark.

Commercial Paragraphs.

THE Rand Drill Co. report the removal of their San Francisco, Cal., office from 223 First street to the Rialto building, additional space being needed because of the rapidly expanding business of this company.

THE Mine & Smelter Supply Co., Denver, Colo., report a rapidly increasing sale of Willey tables. They recently received an order for fifty latest pattern No. 5 tables from the Doe Run Lead Co. of Missouri. A number of improvements have been made on the table recently.

THE Lunkenheimer Co., Cincinnati, O., report that on account of the demand for their line of brass and iron steam specialties they have been compelled to increase their foundry output 50%. Machine tools of the most improved type are being installed in various departments as fast as they can be obtained.

THE Masurite Explosive Co. of New York City have removed their executive offices to Sharon, Pa., where their manufacturing plant, recently completed and covering thirty-seven acres, is located, and their Pacific coast representative, G. W. Myers, Hayward Bldg., San Francisco, Cal., announces that westward shipments of masurite will soon begin. He will also establish a magazine near San Francisco, Cal.

THE Union Iron Works of San Francisco, Cal., is installing a power transmission plant near Reward, Inyo county, Cal., from which it will transmit power electrically 2 miles to the mill of the Reward G. M. Co., where induction motors will be used to drive a 20-stamp mill, air compressor and rock breaker. The apparatus, which has been bought from the Westinghouse Electric & Manufacturing Co., includes a 120 K.W., three-phase alternator; a 2 H. P. exciter; a type "6" switchboard panel, including voltmeters, ammeters, rheostats, etc.; two 50 H. P. type "C" induction motors, complete, with auto-starters, slide rails, etc.; a 15 H. P. induction motor; three 7½ K.W., O. D. transformers; two 1 K.W., O. D. transformers, and eight lightning arrester units. The transmission will be at 2200 volts.

A. RIEPPEL, Koeniglicher Baurat, of Nurnberg, Germany, managing director Augsburg Nurnberg Mfg. Co., builders of structural iron work, engines, bridges, cars, etc., in Europe, is visiting in the United States for the first time. His works employ 16,000 men and have over 2000 at work on the bridges, etc., of the new railroads being built by Germany in China. Their latest success has been with gas engines, both for gaseous and liquid fuel. They have long built these engines in

smaller units up to 400 H. P. and operated with petroleum; but for the use of waste gas as well as producer gases, and in larger units, they have recently developed an entirely new design. The engine, which is of the double-acting cycle type, generally in tandem arrangement, is best adapted for the various purposes of modern power development up to the largest units required by municipal central stations and iron and steel works. Rieppel's visit was made to interest the Allis-Chalmers Co. in the manufacture of the products of his company. A contract was entered into by the two companies giving the Allis-Chalmers Co. the exclusive right to manufacture and sell the Nurnberg gas engine for the United States and selling rights in the far East and South Africa. The Augsburg Nurnberg Mfg. Co. have within the past few months received orders for 50,000 H. P. throughout Germany and Spain, chiefly for generating electric energy and for blast furnace and spinning mill work. One of these engines is being built for an important spinning mill in northern Germany, where the engine will be operated by producer gas. Mr. Rieppel is on a tour of inspection throughout the United States, after which he will visit the new and extensive works of the Allis-Chalmers Co. at West Allis, where these engines will be built.

Books Received.

A treatise on "Electro-magnetic Phenomena" and on the "Compass and Its Deviations Aboard Ship," by Commander T. A. Lyons, U. S. A. This is published in two volumes: Vol. I, 556 + XV pages, 385 figures and plates, \$6 net; Vol. II, 582 + VII pages, 203 figures and plates, price \$6 net; express or postage additional. John Wiley & Sons, New York; Chapman & Hall, London. These volumes treat on electro-magnetic phenomena, dealing with all that is latest on this interesting subject. Among other subjects treated, are the sun's spots, the Aurora, electric discharges in high vacua, magnetic storms and telluric currents, and also the electro-magnetic theory of light. In the second volume the compass forms an interesting chapter and considerable space is given to the mathematical theory of deviation of the compass. These volumes are replete with information along the lines indicated which is of great interest to engineers, navigators and others interested in the pursuit of knowledge in the science of electro-magnetism.

Catalogues Received.

The five-ply, welded chrome steel vault plate manufactured by the Chrome Steel Works of Brooklyn, N. Y., is fully described, with a chapter on its uses, in a recent catalogue issued by them.

The Austin Mfg. Co. of Chicago, Ill., has issued a handsome catalogue, profusely illustrated and descriptive of the Austin gyratory crusher and its application to mining, quarrying, etc. Their conveyors, grade wagons and dump cars are also completely described. The catalogue is a work of art from the typographical standpoint.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

NUT LOCKS.—No. 727,393. May 5, 1903. W. A. Lewis, Battle Mountain, Nev.; two-thirds assigned to R. M. Horton and John Diamond of same place. This invention is designed to provide a simple, effective nut-locking device for use in bridge building, railway construction, and wherever there is a tendency for nuts to jar loose. It consists in the combination of a nut lock of a bolt, a nut screwing thereon, a wedge pivoted in the head of the bolt, a second nut screwing on the bolt and engaging said wedge and having a notch undercut in the direction of the threads of said nut, and latch means carried by the first named nut engaging said notch.

STEAM GENERATING FURNACE.—No. 727,346. May 5, 1903. J. L. Groux, Jerome, Ariz. This invention relates to a combination furnace and steam generator in which a crucible occupies the lower part of the furnace, and above this are a series of approximately vertical water tubes connected at the lower end with a water supply pipe and at the upper end with a steam drum. It consists in the combination with these water tubes of a series of inclosing water jackets properly spaced to allow the water tubes to pass between the water jacket sections and communicate with the water supply and steam drum which are exterior thereto.

WAIST FORMERS.—No. 727,273. May 5, 1903. F. S. Boedfeld, San Francisco, Cal.; one-half assigned to Wm. L. Spencer of same place. This invention relates to improvements in garment supporting devices, particularly to that type adapted to be attached to a corset for the purpose of holding the

waist in proper position. Its object is to provide a simple adjustable waist holder or former that can be quickly attached to or detached from the corset after the latter has been fastened and which will not become readily released therefrom accidentally.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MAY 5, 1903.

727,252.—DISPLAY FRAME—J. B. Allen, S. F.
727,053.—SEWING MACHINE—D. L. Anthony, Sacramento, Cal.
727,052.—EXPLOSIVE—M. W. Beardsley, Oakland, Cal.
727,044.—CIRCUIT CLOSER—W. J. Bell, Los Angeles, Cal.
727,273.—WAIST FORMER—F. S. Boedfeld, S. F.
727,275.—ANIMAL TRAP—C. C. Bowen, Los Angeles, Cal.
727,072.—SAND PUMP—A. J. Bramlette, Downey, Cal.
727,077.—LOCATING MINERALS, ETC.—F. H. Brown, Los Angeles, Cal.
726,801.—SMELTING FURNACE—A. W. Catton, West Seattle, Wash.
727,801.—VAPOR STOVE—L. Dahl, Palo Alto, Cal.
727,814.—NUT LOCK—J. A. Duffy, Pomona, Cal.
727,815.—FIRE ALARM—T. B. & F. A. Duncan, Newberg, Ogn.
726,855.—GOLF CLUB—J. D. Dunn, Los Angeles, Cal.
727,316.—STEAM GENERATOR—J. L. Groux, Jerome, Ariz.
727,421.—COMBINATION TOOL—W. E. Haight, McMinnville, Ogn.
727,332.—TREATING ORES—H. Hirschling, S. F.
727,027.—BLEACHING NUTS—H. J. Hoffmayr, Ventura, Cal.
726,939.—TRACTION ENGINE—J. K. Kendrick, Germantown, Cal.
727,393.—NUT LOCK—W. A. Lewis, Battle Mountain, Nev.
727,414.—OIL BURNER—J. McDermott, West Berkeley, Cal.
727,415.—OIL BURNER—J. McDermott, West Berkeley, Cal.
726,973.—COMBINATION TOOL—J. D. McKinnon, Portland, Ogn.
727,193.—HANDCUFFS—J. W. Pettijohn, Montesano, Wash.
726,454.—CHICKEN ROOST—E. Royce, No. Yambill, Ogn.
727,464.—DRESS FORM—A. E. Scott, S. F.
727,321.—GRAVITY TRACK—C. M. Smith, Los Angeles, Cal.
727,222.—STEERING APPARATUS—C. M. Smith, Los Angeles, Cal.
727,223.—SWITCH—J. Smith, Tacoma, Wash.
727,020.—NEEDLE—Annie W. Simson, Los Angeles, Cal.
727,035.—SASH FASTENER—H. VanWile, S. F.
727,238.—HEATING OVENS—C. E. Warren, Los Angeles, Cal.
727,243.—KNEE PROTECTOR—Martha M. White, Campbell, Cal.
727,045.—BRAKE FITTING—O. Whitmore, San Diego, Cal.
727,527.—FENCE WIRE CLAMP—G. H. Wright, Spokane, Wash.
727,529.—LOGGING DOG—C. J. Young, Seattle, Wash.

Latest Market Reports.

SAN FRANCISCO, May 15, 1903.

METALS.

SILVER.—Per oz., Troy: London, 24½d (standard ounce, 925 fine); New York, bar silver, 54c, refined (1000 fine): San Francisco, 54c; Mexican dollars, 40 @ 42c San Francisco, 42c New York.

Silver has shown no material change the past week, but a further advance is looked for, as the demand is somewhat greater than the normal supply. That is the silver resulting from the treatment of gold, lead and copper ores. There are few mines operating in the United States which are strictly silver producers only, the metal usually being associated with sulphides of the base metals and with gold. Should the price go much higher or show an indication of remaining at or near the present price indefinitely, it will no doubt have the effect of reopening silver mines now idle.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50 @ 14.75; Electrolytic, 1 to 3 casks, \$14.50 @ 14.75; Casting, 1 to 3 casks, \$14.50 @ 14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £63 2s 6d spot per ton.

The consumption of copper for 1902 was divided among the following countries: Germany, 107,906 tons; France, 55,550; England, 121,877; North America, 224,000; Austria-Hungary, 22,440; Russia, 24,398; Italy, 14,063; Scandinavia, Spain, Belgium, Turkey and Asia, 20,000 to 25,000, making a total of 595,234 tons. The production during the same period was 557,492 tons, showing that the consumption was about 40,000 tons in excess of the production.

The metal shows no material change in price, though it is thought a somewhat higher price may be reached; but it is not likely to go above 15 cents and remain there for any considerable period.

LEAD.—New York, \$4.37½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$1.50, carload lots; ½c 1000 to 4000 lbs.; pipe ½, sheet 6, bar 5½c; pig, \$4.75. London: £11 8s 9d per long ton=2.75c per lb.

SPELTER.—New York, \$5.75; St. Louis, \$4.60; London, £21 7s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$29.65 @ 29.75; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33c; bar tin, 3½c, 35c @ 37½c. London, £134 10s spot.

PLATINUM.—San Francisco, crude, \$18.00 per oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 per flask of 76½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 31c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17.15c.

NICKEL.—New York, 50 @ 60c per lb.; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$20.60 @ 21.50; gray forge, \$19.85; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$31.50; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.25; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. O. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$5.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c per set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmore, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ¾c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ¾c per lb. above keg price. Dry Lead—in bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb powdered, 9 @ 12c; fused, 25 @ 30c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—Pure, 1 lb., 60c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

BISMUTH.—Subnitrate, per lb., \$1.60.

SODIUM.—Metal, 1 lb., \$1.00.

MERCURY.—Bichloride, 1 lb., 90c.

PHOSPHORUS.—(American) 1 lb., 75c.

SILVER.—Chloride, 1 lb., 90c @ \$1.00; nitrate, 55c.

URANIUM.—Oxide, 1 lb., \$3.50.

ZINC.—Metallic, chemically pure, 1 lb., 50c; dust, 1 lb., 10c; sulphate, 1 lb., 10c. (These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

SITUATIONS WANTED.

COMPETENT MILLMAN, MACHINIST AND Chemist. Experience free mill and concentrating. College education. Have built and operated mills in Montana for 12 years. Competent accountant and able to administer affairs of a company. Would like situation with a company out of a promoter's hands. References the best. Address H., care this office.

CYANIDE CHEMIST OR MILL SUPT. Technical graduate. Specialty, construction; also, successful treatment of low grade ore and slimes. Good references. Address "Spanish," this office.

MILLMAN DESIRES POSITION WITH GOLD mining company to erect or take charge of stamp mill. Extensive experience gained in the treatment of ores in United States, Central and South America. Can assay and test ores to determine best method of treatment. Excellent references. Address "Aurum," care of this office.

MINE FOREMAN WISHES A CHANGE OF position—foreman or superintendent. Age 37. Experience, 13 years. Can assay and survey. State locality and salary paid. No objection to South America or Mexico. Some knowledge of Spanish. Address M. O. I., this office.

POSITION WANTED IN ASSAY OFFICE AS assistant by man 30 years old. Just finished year's course in good school and not afraid of work. Mexico or Arizona preferred. Address R. H. C., this office.

WANTED.

WANTED—Some Party for Half Interest, to pay expense of three practical miners, to prospect in Mexico. Best references given. Address Box 644, Phoenix, Arizona.

WANTED—MILL TAILINGS, Gold, silver or lead, in New Mexico, Arizona or old Mexico. Will buy or lease. Give location, quantity and value. A. E. VAN VELSAN, Telluride, Colorado. Box 181.

Wanted, by a Prominent Mining and Smelting Company, A LARGE COPPER PROPERTY in Mexico, Arizona, Utah, or New Mexico, sufficiently prospected to admit of intelligent examination. Address Box 28, this office.

Wanted—A Superintendent

For foundry, forge, machine and boiler shops employing 200 men. Should be posted on mining machinery, structural work and up-to-date methods. Permanent position in excellent location. State qualifications and experience fully and salary expected. Answers confidential. Address Z. P. O. Box 153, Station C, Los Angeles, Cal.

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If you are a stockholder in any good going mining company and want to sell your shares

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THE CALIFORNIA DEBRIS COMMISSION having received application to mine by hydraulic process from W. F. Mills, in Willow Creek Consolidated Mine, near Camptonville, Yuba County, Cal., draining into North Fork of Yuba River which reaches Feather River, gives notice that a meeting will be held at Room 96 Flood Building, San Francisco, Cal., June 1, 1903, at 1:30 P. M.

PRINTING. We furnish all stock and do printing at the following prices: 100 envelopes 40 cts., 500 \$1.25, 1000 \$1.75. Bill heads, note heads, cards, tags, etc., at same price. Samples of work free. Pacific Commercial Co., 325 Davis St., San Francisco, Cal.

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I have several good prospects for sale, located in known mineral belt in Tonopah mining district. Groups suitable for incorporation. Claims \$100.00 to \$250.00 each. Correspondence solicited.

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ASSESSMENT NOTICES.

MARINA MARSICANO GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 20th day of April, 1903, an assessment (No. 25) of five cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 415 Front street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 25th day of May, 1903, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 15th day of June, 1903, to pay the delinquent assessment, together with the costs of advertising and expense of sale.

By order of the Board of Directors.
CHAS. BOVONE, Secretary.
Office—415 Front street, San Francisco, California.

WILLIETTA MINING AND MILLING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Jacksonville, Tuolumne County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 23rd day of April, 1903, an assessment (No. 6) of one (1) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Rooms 233-234 Crocker Building, corner of Post and Market streets, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 4th day of June, 1903, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on THURSDAY, the 2d day of July, 1903, to pay the delinquent assessment, together with the costs of advertising and expense of sale.

By order of the Board of Directors.
M. McALLISTER, Secretary
Office—Rooms 233-234 Crocker Building, corner of Post and Market streets, San Francisco, California.

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Our engines cost hardly a third as much as horses, for hauling heavy loads, and are rapidly displacing them for hauling ore, stone, lumber, etc., when the work is sufficient so that an engine can be used to advantage. They work 24 hours a day, never tire, sicken or die, and eat only when at work. We make them for all countries, all climates, all soils—from plowed fields to rocky wastes or forest stubble. We have large experience.

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Bleichert Wire Rope Tramway,

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Manufacturers, Engineers and Contractors, and Sole Licensees in North America for the Bleichert System.

Also, Wire Rope Equipments for Cable Hoist Conveyors, Surface and Underground Haulage, Transmission of Power, etc.

No lugs or knots of any kind required on the traction rope, giving longer service, and saving in repairs.

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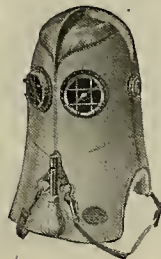
Chicago Office--1114 Monadnock Building

DENVER OFFICE--R. D. SEYMOUR, Manager, 1711 Tremont St.

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MINING AND SCIENTIFIC PRESS

Whole No. 2235.—VOLUME LXXXVI.
Number 21.

SAN FRANCISCO, CAL., SATURDAY, MAY 23, 1903.

THREE DOLLARS PER ANNUM.
Single Copies, Ten Cents.

Rapid Shaft Sinking.

On the Witwatersrand in South Africa some rapid shaft sinking has been done at several of the mines. Among the most noted of them are the Catlin, Milner and Rudd, and more recently the Wolhuter. The Catlin shaft of the Jupiter Co. was started in June, 1896, and work continued till March, 1897, during which 906 feet were sunk at an average of 90.6 feet per month. Sinking was resumed in this shaft in January, 1898, and during the twelve months of that year 1695 feet were sunk, or an average of 141 feet per month. Later, in 1899, this shaft was carried down at an average of 144 feet per month. The shaft is now over 3750 feet deep.

The Howard shaft of the Simmer & Jack West was sunk for twelve months from 891 to 1551 feet at an average of 129.2 feet per month.

The Milner shaft of the South Geldenhuis Deep from August 1, 1898, to August 31, 1899, sank at an average rate of 152½ feet per month, and the Rudd shaft, on the South Rose Deep, from September 1, 1898, to September 30, 1899, was sunk at an average of 138 feet per month to 2425 feet.

In November, 1902, the Wolhuter shaft was sunk 209 feet in thirty days, which was the most rapid shaft sinking in hard rock ever recorded.

In sinking these deep shafts there are two contingencies always given consideration. These are possible large volumes of water and increase of temperature. Some records made in the Rand shafts as to amount of water encountered are of interest, and show the greatest volume of water to be com-

paratively near the surface, for in great depth there is much less water.

The Robinson Deep pumps from its shafts 88,000 gallons per twenty-four hours, of which 60,000 gallons are from a depth of 166 feet from the surface.

The Rhodes shaft at 2015 feet raised 28,820 gallons in twenty-four hours, of which 28,280 gallons were raised from the 500-foot station and 540 gallons from the 1800 point.

The Howard shaft is 3408 feet deep and is dry at the bottom, though 11,500 gallons are raised from 250 feet and 320 from 1300 feet.

The Catlin shaft at 3750 feet depth raised 4608 gallons per day from 130 feet below the surface and 1840 gallons from 1500 feet. The bottom of the shaft is dry.

The Angelo Deep was sunk 2300 feet and had a pumping station at 250 feet and another at 500 feet, the water making at the rate of 2000 gallons per day. Below the 500 the shaft was dry. A borehole was drilled in the bottom of the shaft, going down 240 feet, where a flow of 1500 gallons per day was encountered. Below this point in the borehole no water was encountered.



Hoist Royal Con. Mine, Hodson, Cal. (See page 336.)



MINING AND SCIENTIFIC PRESS

Retaining Walls of Concrete and Ore Bin Supports, Royal Con. Mill, Hodson, Cal. (See page 336.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Holst Royal Con. Mine, Hodson, Cal.....	327
Retaining Walls of Concrete and Ore Bin Supports, Ro al Con. Mill, Hodson, Cal.....	327
Facsimiles of Early Copies of the "Mining and Scientific Press".....	330-331-332
The Drainage Tunnel, Cripple Creek, Colo.....	333
Mining and Metallurgical Patents.....	333-334
Cross-Section Royal Con. Mine, Hodson, Cal., Showing Method of Mining and Transportation of Ore to Mill.....	337
Royal Con. 120 Stamp Mill, Hodson, Cal.....	337
End Elevation Royal Con. Mill, Showing Construction.....	337
EDITORIAL:	
Rapid Shaft Sinking.....	327
Forty-three Years Old.....	328
The March of Progress.....	328
The Source of Gold.....	328
Operating Costs on the Mother Lode.....	328
Important Decision.....	328
Lead Ore Assays.....	328
MINING SUMMARY.....	339-340-341-342-343
LATEST MARKET REPORTS.....	344
MISCELLANEOUS:	
Concentrates.....	329
Looking Backward.....	330-331-332
Ore Treatment at Mt. Lyell.....	332
New Mexico School of Mines.....	333
The Cripple Creek Drainage Tunnel.....	333
Mining and Metallurgical Patents.....	333-334
Head Works Framing—Primary Notions.....	335
Electrolytic Refining of Gold.....	335
The Commercial Assay of Lead Ores.....	335
New Plant of the Royal Con. Mines Co., Ltd., Hodson, Cal.....	336-337
Ore Deposits of Tonopah, Nevada.....	338
Costs in the Elmore Process.....	338
Milling at To opah, Nev.....	338
Personal.....	343
Obituary.....	344
Commercial Paragraphs.....	344
Books Received.....	344
New Patents.....	344
Notices of Recent Patents.....	344

Forty-three Years Old.

It will be 43 years to-morrow since the MINING AND SCIENTIFIC PRESS was established. That is, to-morrow, May 24, 1903, this journal will enter upon its 44th year of successful existence. In this issue is presented a photographic reproduction of the front page of No. 1, Vol. I, May 24, 1860. There is also reproduced the front page of the issue of Nov. 30, 1860, when the title of the journal was changed to the MINING AND SCIENTIFIC PRESS. There is likewise reproduced from page 150 of that issue the little notice of \$2500 reward (which the MINING AND SCIENTIFIC PRESS afterwards increased to \$5000) for some process to treat gold sulphurets, and which occasioned the invention of the chlorination process, thus solving an important metallurgical problem of that day.

An illustration of how the journal looked in 1860 is deemed of sufficient interest to be shown in the issue of to-day, No. 2235. These 2235 numbers of the MINING AND SCIENTIFIC PRESS, from May 24, 1860, to May 23, 1903, contain and comprise all that is known of modern mining and metallurgy, a progress and development in which this journal has borne prominent part. What has been done is but an index of the future. More need not be said; less could not be said.

The March of Progress.

Frequently announcement is made that some one has invented or discovered a new process "which will revolutionize the mining industry." None of these processes have accomplished this result as yet, though there are processes which have had an important influence on the industry of mining. Pyritic smelting, though not a new process, has only of late years been successfully applied in the United States, but its influence is felt in many districts, for by its means costs may be reduced in some cases to such

an extent that commercial success is now made where it had previously been impossible. The separation of zinc from other minerals in the concentration of complex sulphide ores is also an important step in the metallurgical field. Many of the claims for the cyanide process, which ten years ago were looked upon with distrust, have since become accomplished facts and, in some respects, the process has achieved more than was originally claimed for it by its early advocates. There is still room for other and newer processes, and still opportunity to reduce the expense of ore reduction. Experiments are constantly in progress with a view to improvement and reduction of cost. This constant effort and competition have resulted in saving a higher percentage of values, at less cost, until the limit seems to have been reached, but, as in the past, the future will show that we are not now looking far enough ahead, and additional improvements and reductions in cost may still be anticipated.

The Source of Gold.

The greatest incentive the miner has to seek for gold is the discovery of rich ore or placer gold in an unsuspected place. There are streams, gulches and flats, famous in mining history for the rich placer mines developed in them, but the source of the gold is not always apparent. Generally, in these later days there are those who at once seek the source of the gold found in rich placers, in the belief that a more valuable and permanent mine is likely to result if this source can be found. There are instances where years have passed before the source of gold in a placer gulch has been recognized, and in some instances the original source of the gold still remains undiscovered. The trained geologist in such cases, after careful investigation, can usually reach a conclusion, satisfactory to himself, but the miner is often at a loss to account for the existing condition of things. It is not always found that a rich vein produces rich placer deposits. The erosion of veins and deposits which produce telluride gold ores does not always result in rich placers. The erosion of the telluride ores of the Black Hills, South Dakota, has not, as far as known, resulted in placer deposits, though those of Cripple Creek, Colo., occurring under entirely different conditions—in fissures, instead of blanket deposits—have produced placers. In some regions rich placer deposits have been discovered and worked out, and the source from which the gold came has never been satisfactorily determined. The ancient river channels of the Forest Hill divide, Placer county, Cal., which have produced many millions, appear not to have derived their gold from quartz veins such as exist in other portions of the State, but seem to have been the result of erosion of a slaty or schistose rock, in which the gold occurred in narrow seams and in pockets. In some of these mines large nuggets have been found in which the edges of the crystallized gold were still sharp, being little or not at all abraded by the detritus of the stream, being conclusive evidence that the gold is found near its original source. Gold has also been found in the bedrock in situ, further proving that the gold of that section is derived from the pockets and seams in the rock, and not from quartz veins of the ordinary type.

Operating Costs on the Mother Lode.

The annual report of the Central Eureka mine, at Sutter Creek, Amador county, Cal., affords valuable information as to the costs of operating on the Central Gold Belt of California, commonly known as the Mother Lode. The Central Eureka mine lies between the South Eureka, down 2300 feet, and the Amador Consolidated, familiarly known as the Old Badger and Eureka, down 2100 feet, but with the collar of the shaft more than 100 feet below that of the Central Eureka. The shaft of the latter mine is an incline down about 2100 feet. The angle of dip is about 65°. The formation passed through is black slate and amphibolite schist. The slates of the foot wall swell upon exposure to the air and are a source of much expense. In this respect, however, they are not so bad as those in some of the other mines of the vicinity, notably the Oneida. The Central Eureka has a single fissure extending from the surface to the lowest development. This fissure is filled with either

crushed and foliated black slaty material—the "gouge" of the miners—or with a massive or ribbed quartz. This latter occurs in large, lenticular vein-like sheets and varies in width from a few inches to 20 feet. The mine is systematically opened and well ventilated. Slips and offshoots are unusual, and the mine is really the simplest proposition to handle in that part of the State. With the above facts in view, the figures given by the superintendent will be comprehensible. The tonnage hoisted and milled during the year ending April 1, 1903, was 43,545 tons. The value of this in free gold (amalgam) was \$213,421.17 and in sulphurets \$48,481.83—a total of \$261,903. This represents a run of eleven months, the mill having been closed down thirty days owing to lack of electric power. The cost of mining was \$1.795; cost of development, \$0.519; cost of milling, \$0.490. Total cost per ton, \$2.804. This statement is one of the lowest as to cost that has been made on the Mother Lode of California. Reports of other mines of Amador county, showing the cost to be greatly in excess of these figures, is due to difference in conditions under which the respective mines operate. Some mines constitute all costs a charge against the ore, and while construction is really not a mining expense, it is essentially incidental, and is eventually charged against the ore. This is usually arranged for by the creation of a sinking fund to provide for deterioration, etc., but in the report of the Central Eureka such provision is not mentioned. The construction account shows an expenditure of \$20,125.65—chiefly in adding twenty stamps to the mill.

Important Decision.

The United States Supreme Court has rendered a final decision in what have become known as the "Scripper land cases," which affected the title to a large area of oil-bearing lands in the upper San Joaquin valley, in California. The decision is in favor of the original locators of the oil lands. The contestants attempted to take up this land as agricultural land by the use of "lieu land script" issued to them in consideration of the return to the Government of certain forest land which they had previously filed upon.

Previous to this decision of the Supreme Court, the lower courts, Secretary of the Interior and the General Land Office had ruled against the "scrippers." The Supreme Court decision is final and the oil men are confirmed in their title to these valuable lands. The most important point in the decision is the establishment of the fact that oil lands are mineral lands, and may be located as such under the law. Petroleum has always been considered a mineral, and the classing of petroleum-bearing lands as mineral lands is only reasonable and proper. Ex-Secretary of the Interior Hoke Smith, in August, 1896, ruled that petroleum-hearing lands were not mineral lands and could not be entered under the mining laws, and might be selected by States in lieu of lost sixteenth and thirty-sixth sections, but Congress intervened and passed an act in February, 1897, which provided that any person authorized to enter lands under the mining laws of the United States, may enter and obtain patent to lands containing petroleum, or other mineral oils, and chiefly valuable therefore, under the provisions of the laws relating to placer mineral claims. The development of oil lands will undoubtedly be stimulated in some sections by this decision, as the cloud upon the title of certain lands will now have been cleared away.

Lead Ore Assays.

In view of the considerable discrepancy often noticed between the fire assay and volumetric method of determining the percentage of lead in ores, the Colorado Scientific Society has appointed a committee of mining men to investigate the relative commercial value of the two methods of assaying lead ores. Some years ago a similar investigation was made as to the proper method of determining the copper contents of ores and a satisfactory basis was reached, and it is now thought a similar result will follow the investigation of lead assaying methods. The committee consists of C. S. Palmer, Richard Pearce, Philip Argall, W. F. Hildebrand, E. C. Woodward, E. N. Hawkins, A. W. Warwick, Henry E. Wood and C. R. Rose.

CONCENTRATES.

GOOD plaster of Paris will stand a pressure of 1000 to 1500 pounds per square inch. Its power to resist pressure varies greatly.

RECKONED at \$1 per barrel, the 1903 oil output of California would be worth more than the gold output of that State if approximating 20,000,000 barrels.

A GOOD MICA MINE can be disposed of easily. The increased use of mica for electrical purposes has made a big market for the product. Good clean large plates of mica are very valuable.

"SALT CAKE" is a commercial name given to crude sodium sulphate, and is an intermediate product in the manufacture of sodium carbonate from sodium chloride. It is employed in glass making.

It has been estimated that the gold production and life of the main reef series, Witwatersrand, South Africa, would insure a life of forty years, and at a depth of 6000 feet, worked at a lesser cost than that of the past, all of which, from present knowledge and conditions, seems probable.

In many pyritic smelting plants small amounts of coke are used to prevent the tuyeres becoming clogged or too brittle. The coke is fed around the edge of the furnace so that it sinks down with the charge and is consumed where it will be of the greatest service for the purpose intended.

Of the rock samples sent from Cambria, Cal., No. 1 is a gypsiferous marl and No. 2 a shelly marl. The six-sided crystals in No. 1 are prisms of gypsum. The yellowish-brown material in No. 2 is colored by iron oxide. Neither of these rocks are indicative of oil. Many rocks give off a fetid odor when struck.

WHEN measuring black pipe (steam or gas) it is customary to include couplings in the measurement. It is unsafe to order pipe to the exact amount required unless the order be specific and the pipe "cut to order," as pipes vary within a foot or more in length, running generally from 18 to over 22 feet in length.

IT IS not apparent what value can be found in a comparison of costs at the Alaska-Treadwell mine in Alaska, where large amounts of ore are broken in open cuts, and the cost in a mine on the Rand in South Africa at a depth of 6000 feet. The conditions in every respect are so different that a comparison from any standpoint is of no value whatever.

HYDRAULIC LIMESTONE is limestone that will make a cement that will set under water and is composed of calcium carbonate, magnesium carbonate, silica, alumina and iron oxide. Its "setting" is due to a chemical combination of lime and magnesia with alumina and silica. It is between a calcareous and argillaceous formation, is fine grained and has a splintery fracture.

LAGGING may be dispensed with in a shaft where the rock through which the shaft passes is hard and massive—there being no danger of small pieces crumbling from the wall and falling into the shaft. Where 2-inch plank is employed as lagging in a three-compartment shaft of ordinary size, the number of board feet in the lagging nearly equals that in the square timbers used in the frame.

FLUORSPAR of good grade is in demand as a flux. The mines of southern Illinois and northern Kentucky mine most of the fluorspar used in the United States, the mineral here being found in conjunction with lead. Steatite or talc, particularly of a good grade, find ready markets. The enormous sales of talcum powders for medicinal purposes has made a good talc mine a much sought for prize.

THERE has never been a known discovery of native zinc. But one report of its occurrence was ever made—that being from northern Alabama—but investigation proved the story a canard. Why nature failed to produce zinc in native state is a great mystery, and likely to remain so. One real specimen of native zinc would be far more valuable than its weight in gold, because of its value to mineral collectors.

WHEN a piece of defective fuse is found in a box, a number of pieces should be cut from several rolls and tested. If the several samples show considerable discrepancies in time, the entire lot in the box may be deemed unsafe. Many accidents are due to defective fuse, and great caution should be exercised in approaching a "missed" hole. It is always safe to allow plenty of time to elapse before making an investigation.

SYLVANITE is double telluride of gold and silver, containing more gold than petzite and less silver, its composition being 28.5% gold, 15.7% silver and 55.8% tellurium. The two minerals are easily distinguished, sylvanite being steel gray to silver white, a brilliant, beautiful mineral, having a characteristic crystalline structure, to which it owes its name of "graphic tellurium," the

arrangement of the crystals resembling Arabic lettering. It is much softer than petzite.

THE fusion of sulphides, sulphates and phosphates with reducing agents is detrimental to platinum crucibles, as heated platinum is attacked by free sulphur, phosphorus, arsenic, selenium and iodine. Lead, bismuth, tin, mercury, antimony, zinc, or their compounds, are most harmful, forming fusible alloys. Platinum vessels which have become tarnished from constant using, are best cleaned by fusing borax in and around them, or by boiling in nitric acid. They may be scoured with fine beach sand, but will lose weight more rapidly from this treatment.

THE best safeguard and protection to the investor in a mining enterprise is the honesty of the men promoting it, and the investors' intelligence and knowledge of the property. The last item can be secured by the services of one competent to make an exact report on the property. The fact that the special property mentioned adjoins a big paying mine is not considered an absolute assurance that it also would be a paying property. This fact is readily understood by mining men, but sometimes is a little hard to be seen by people who consider the subject solely from a real estate standpoint.

CALAVERITE is the telluride of gold; hessite is the telluride of silver. Hessite resembles argentite—sulphide of silver, often called "silver glance." The former contains 62.8% of silver, 37.2% tellurium; the latter is composed of 87.1% silver and 12.9% sulphur. Both are sectile, can be cut by a knife, like wax; both are steel gray to iron black in color, the silver sulphide being darker than the corresponding telluride. With hessite gold sometimes enters into its composition, so that it finally gradates into petzite, which contains 41.86% silver and 25.60% gold, combined with 32.54% tellurium. Petzite, although darker, is also steel gray to iron black in color, but it is more brittle than hessite.

LEAD occurs native sparingly in nature. No occurrence of any importance has ever been noted in America. In New Jersey, at Franklin Furnace, the zinc mines have produced a few specimens, showing very small globules of native lead, but these, as specimens, were of little value. From Sweden is obtained specimens of native lead in which the lead is in mass and readily discernible. The best mineral collections contain choice specimens of these Swedish native leads. Of late but few good specimens have been mined. Specimens showing a bit of lead weighing a quarter or half an ounce sell as high as \$15, and the demand is usually far ahead of the supply. Native lead has also been reported in Canada.

By "limerock" it is presumed that ordinary limestone is meant. It is of two varieties—limestone and dolomite. Pure limestone is calcium carbonate, and when crystallized is called marble. Composition: Calcium dioxide, 44; lime, 56. Dolomite is carbonate of calcium and magnesium. Composition: Carbon dioxide, 47.9; lime, 30.4; magnesia, 21.7. When iron carbonate is also present the rock is called ankerite. When carbonate of lime is deposited from calcareous springs it is called travertine. When deposited in caves, from dripping of water, the calcareous deposits are called stalactites or stalagmites. Aragonite is also a variety of calcium carbonate. It is distinguished from calcite by higher specific gravity and absence of rhomboidal cleavage.

CHEAP MINING is only possible where the proper conditions exist. Some of the essential features for cheap mining are a large ore body, easy ground, little or no water to contend with, cheap and abundant timber, and waste for filling abundant and easily obtainable. In reduction the ore must be easily treated, requiring no extraordinary process for its reduction and saving of values. If it is smelted an ore that is self-fluxing is preferable to one that requires the addition of flux, which means increased cost. The efficiency of the labor employed is also an important factor. Inefficient labor does not always receive the minimum of wages. Transportation and handling of ores is a matter for important consideration. Too much handling is expensive and should be avoided as far as possible.

WHERE high temperature is encountered in deep mine workings the temperature is usually greatly reduced when connection is made with other workings reaching to the surface. Where a mine is operated through a single shaft ventilation may be improved by bratticing the shaft. That is lining one or more of the compartments tightly with boards and extending the lining as close to the bottom as practicable. This results in making a "down cast" of one compartment of the shaft and an "up cast" of the other compartments. When this is done to secure improved ventilation it is a good idea to brattice the manway compartment and carry up a tower some distance above the surface. This gives an unequal height to the two columns of air in the shaft and better circulation of air results.

GYPSUM is always associated with salts found in sea water, chloride of sodium, chloride of calcium, chloride of magnesium, and sulphate of soda. Of all the solid matter contained in sea water, gypsum is the least soluble, and therefore the first to crystallize. It is thus deposited by itself, and forms continuous and regular strata, miles in extent and of great thickness. The next

ingredient that would be thrown down in the evaporation of sea water would be chloride of sodium. Some authorities believe that the oil fields of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky were once the bed of a great inland sea, arguing that when salt begins to crystallize from the evaporation of sea water, it forms into a cube, which sinks just below the surface of the water, and on the sides of this cube others attach themselves, thus forming a rectangular hollow, or hopper-shaped, vessel. Salt has been found in the States of Pennsylvania, Ohio, etc., in this condition, in beds of gypsiferous clay several hundred feet beneath the surface, and as it is impossible for salt to assume this shape, except at the time of crystallization in water, it follows then that that area was once an inland sea.

TESTS for tellurium in ores may be made as follows: On charcoal, a volatile white coating with red or yellow border. If the fumes be caught on porcelain the resulting gray or brown film may be turned crimson when moistened with concentrated sulphuric acid and gently heated. Tellurium turns the blowpipe flame green. Boiled a moment in concentrated sulphuric acid there results a purple violet solution, which loses its color on further heating or on dilution. In assaying ore containing gold and silver with tellurium for high-grade ore, take of ore one-half assay ton, litharge four assay tons, soda (bicarbonate) one assay ton, silica one assay ton, argol one and one-half grams, borax glass ten grams; salt cover. For low-grade ore: Ore two assay tons, litharge four assay tons, bicarbonate soda two assay tons, silica one and one-half assay tons, argol two grams, borax ten grams; salt cover. Scorch the buttons if brittle. Cupel at low heat near the end, as the button has a tendency to separate into small particles. The assayer must modify the charges to suit the particular ore he is treating. An examination of the slag and button will often suggest what change should be made if assay is unsatisfactory.

SELDOM are seen good mines advertised for sale, even in papers published in the mining districts. Yet there seems to be no good reason why this class of property should not be thus put before the buyers. The general way is for some promoter, or middle man, to get a bond on the mine and then try to sell it at a much advanced price over the original one. This system seems to be so thoroughly grafted in custom that it is difficult to change it. The reason is that the miner in the mountains cannot well personally meet the dwellers in the cities who want to buy the mines. When he comes to the city he is at a disadvantage from lack of acquaintance with prospective buyers. If, however, men get accustomed to looking in the local papers for opportunities of this nature, or in mining journals, the present system would be at least modified. The prospector or miner could be brought into immediate contact with the purchaser and the latter would get property without paying a burdensome profit to the promoter. Moreover, with largely decreased cost, many more undeveloped mines would meet with sale. Of course, the promoter system will still remain the best in the case of large properties, where the owners do not care to make generally public the fact that their mine is for sale, not caring to make public advertisement thereof. But there are hundreds of small properties or prospects known in their immediate locality to be for sale, but which outsiders never hear of. Were advertisements of such put into the proper newspapers they would be looked for and many sales made to the advantage of both parties.

THERE is a splendid demand for choice mineral specimens by mineral dealers and collectors. A fine crystallized specimen is usually worth many times its metal value as a specimen. The rare ores of lead are always in great demand, such as cerussite, anglesite, wulfenite, leadhillite, pyromorphite, vanadinite, endlicheite, jamesonite, mimetite, and desclozite. These are produced in varying quantities by mines in America. The mining man upon making discovery of any of these minerals would do well to write to a mineral dealer. Crystals of wire or spongy gold specimens always command a good premium over metal value. Crystallized specimens of antimony are eagerly sought. Kermesite or red antimony ore when in good crystals is valuable. Native amalgam is now and then found. The finder could obtain two or more times its metal value by selling it as a specimen. There is always a good demand for fine smithsonite (zinc carbonate minerals). The nickel sulphide ore millerite, when carrying the needle-like crystallizations, is in great demand. Torbernite, or uranium copper phosphate, when in bright green crystals, is most valuable. Likewise its mate, autunite, with yellow crystals, is much sought for. Vivianite, a hydrous iron phosphate, is found in a number of States. When in good crystals the mineral collector is compelled to pay \$2 to \$3 for single specimens. Manganese minerals are valued highly. Pyrolusite (manganese dioxide) in prisms brings good prices, while that beautiful mineral, rhodochrosite (manganese carbonate), cannot now be had, seemingly, at any price—that is, crystallized specimens. Small specimens of much beauty sell as high as \$50. Wavellite specimens, perfect crystals, are high-priced; \$7 is not an excessive price for a finely crystallized witherite specimen, and fine celestite specimens bring about as much. In the advertising pages of the MINING AND SCIENTIFIC PRESS will be found the names of reliable mineral dealers.



VOL. II.

SAN FRANCISCO, NOVEMBER 30, 1860.

NO. 38.

The MINING AND SCIENTIFIC PRESS is published every FRIDAY at rooms No. 7 and 8, Government House, corner of Washington and Sansome sts., by J. SILVERSMITH, Editor and Proprietor, At THIRTY SEVEN AND A HALF cents per month, or \$3 50 per annum, in advance. Advertisements, Fifty Cents per line

Washoe Items.

We find the following correspondence published in the Nevada Journal:

ESMERALDA, Nov. 11th, 1860.

It is quite warm and pleasant here, for the season, and we have not had any falling weather since my last. Parties are arriving here, daily, from California and Virginia city, for the purpose of examining the different leads, or prospecting in the neighborhood. I hear, almost daily, of new and rich leads being struck, and the opinion of all visitors is that this region of country will fully equal, if it does not exceed that about Virginia city in both the extent and richness of its mineral resources.

Yesterday was made the first *bona fide* shipment, of ore from this district. I do not know the amount of the shipment, but quite a large mule train was loaded with the precious ore from the Esmeralda lead. The last sales made of this lead were \$50 per foot—but there is no ground for sale now, at any price, nor will there be until the result of the crushing of this ore is heard from. The richness of the ore is beyond question, and there is no doubt but the returns when they do come in, will greatly enhance the price of claims.

The tunnels on the north and south of the Esmeralda claims, were commenced on the 8th inst., and are being worked night and day. The work will be completed as soon as possible; the prospects, at the present time, being exceedingly flattering. The prospecting interests are all owned by persons from your place.

VIRGINIA CITY, Nov. 14th, 1860.

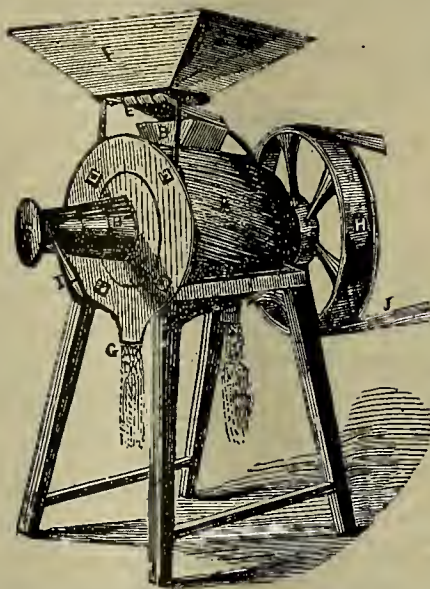
All is peace and quiet here, business generally, is good, and weather fine.

The Mexican Co., expect to make a full and final start of their mill on the 20th instant. They will crush and separate by the old barrel process. They have started their machinery heretofore from time to time, to try the same. The proposed start on the 20th, instant, however will be a final one; and will be made under the most flattering expectations of success.

The mines here are turning out better than was expected a short time ago. The Chollar Company struck water on the 14th inst., and better ore than ever before. They are without doubt on the original Comstock lead. They will not be able to go any deeper with their shaft until the tunnel comes up for drainage, will be about the 1st of February next. The Osceola and St. Louis claims are paying well—mostly gold—these are now considered among the first class paying claims, and are sought for eagerly at \$40 per foot.

IMPORTANT TO THE MINERS—NEW AND CHEAP BLASTING POWDER.—Le Geni Industriel states that a patent has just been taken out in Belgium for a simple method of making blasting powder from spent tan bark. It says that while the price of this powder is less than that of gunpowder it takes but one-seventeenth part as much to produce the same effect. It is composed of 52½ lbs of waste tan bark, and 20 lbs of pulverized sulphur. The nitrate of soda is dissolved in a sufficient quantity of boiling water, and the tan bark added in a manner to completely impregnate it with the solution, after which the sulphur is added in the same way. The mixture is taken from the fire and thoroughly dried, when it is ready for use. If it is wet, it does not permanently injure it, but on being dried again is as good as ever. If fired in the open air, it causes no explosion, but is very efficient for blasting when confined in the usual manner. It is not suitable for use in guns or cannon.

Coleman's Quartz Mill.



In our last issue the type made as say that this mill would crush from six to ten tons of quartz per day, which might be considered overrating its capacity, but the inventor assures us that he will guarantee it to crush from three to five tons per day with the greatest ease. Its practicability has been thoroughly tested by experienced miners, who have certified to these facts with their signatures. We understand that the owners have received a number of orders from Washoe and other points in the interior for this mill, and are extensively engaged in filling them.

A GREAT MANUFACTURING CITY.—Manchester, England, is the greatest manufacturing city in the world. It is stated that the steam force employed in its various mills and manufactories amounts to 1,200,000 horse power. To produce this enormous motive power, 20,000 tons of coal are consumed every twenty-four hours, or 9,400,000 tons in the 313 working days of the year.

A HINT TO MINERS.—The late gale clearly demonstrated that galvanized iron pipe, for the purpose of conveying water to the mining claims, possesses immense advantages over every other method in use, as it may be laid along the surface of the ground, or buried in it, so that the wind cannot injure. It is cheaper than wooden spouting, and much more convenient.—Columbia Times.

RAILROAD MATTERS.—Chenery, Birney and Co. advertise for 60,000 railroad ties for the California Northern Railroad, Oroville and Marysville. They are to be delivered in Marysville, or on the line of the road as per contract. Sealed proposals will be received at the office of D. D. Harris, at Oroville, until Saturday, December 8th. Cash will be paid on delivery, and oak, red fir, or cedar, will be acceptable.

IN MEMORY OF GENERAL HAYEN.—The Mercantile Library Association on Tuesday evening adopted a series of resolutions of respect to the memory of General Haven, the first Vice President of the Society, and most zealous and liberal member.

General Movements of the Earth's Crust.

The general movements of the earth's crust may be classed as follows:

The Seismic or vibratory movement, which occasions earthquakes that modify the surface outline to a very slight extent, and consist of vertical, horizontal, or circular oscillations always violent and instantaneous.

Movements which affect surfaces of greater or less extent, and which are produced so gradually that to recognize their existence, the arrangement and distribution of the seas during geologic periods, must be investigated. These movements, of three varieties, are the reaction resulting from the consequent displacement of the fluid mass in the center of the globe.

Of these varieties, the first is the undulatory movement, which alternately rises and depresses the same small district, and deserves the name I give it, because contiguous to the locality which is sunk there, is another that rises, and conversely. This is the movement which we must suppose in order to explain atolls, the alteration of lacustrine and marine deposits, the accumulation of coal in coal basins, and the displacement of natural basins.

The oscillatory movement, distinguished from the foregoing by its continuance through a longer period of time, and by its affecting vast areas of the earth's surface; compared with the undulatory movement, it is what the tide is to the agitation of the waves.

The intumescent movement, which is the cause of the upheaval of continents, and distinguished from the two foregoing varieties by the persistency with which it acts. During the entire duration of the geological ages, it has been exerted upon certain specific points, which it has been continually elevating, and which thus constitute centers of upheaval. There are five of these centers in France: the central plateau, and the mountain districts of Brittany, the Vosges, the Alps, and the Pyrenees.

The orogenic movement. The arc or curvature of the regions raised by the movements just mentioned is too slight to warrant attributing the dislocations of the crust of the globe to them.

The movement that determines these dislocations is specifically characterized by the elevation of mountain chains, and which we, therefore, very properly designate as orogenic. Its tendency is to fracture the earth's crust, because its action is concentrated along lines, and is abrupt and violent in character. While the undulatory, oscillatory, and intumescent movements are produced slowly during the lapse of a geologic period, the orogenic occurs only at certain intervals, and marks the end of one epoch and the beginning of another.

AN IMPORTANT INVENTION.—Professor D. A. Woodward, of the Maryland Institute School of Design, is the inventor of the Solar Camera, an instrument which enables the photographic operator to take the picture of any object immediately, and of any size desired. It has been found useful in daguerrotypy children and animals. The London and Paris papers speak highly of the invention. A late number of the Paris *La Lumiere* says:

"At the last meeting of the French Photographic Society, Count Aguado presented several pictures obtained by means of Woodward's Solar Camera, and representing animals, taken instantaneously on quarter plates. It is impossible to produce anything more perfect of this kind. Animal painters after this must despair. There was, in particular, a front view of a cow, with the body foreshortened, and the head erect, which makes the most charming picture that can be imagined. It is so full of life that you expect every instant to see the animal walk out of the picture."

The London *Photographic Notes* thus winds up a long and interesting notice of Prof. Woodward's Camera:

"The introduction of the Solar Camera, by the ready means it affords of producing life-size portraits from small instantaneous negatives, will no doubt effect a revolution."

PRESS has some item of interest. Each volume is a milestone, as it were, marking the stations along the road of progress. As discovery after discovery was made in mining or metallurgical practice—not then reduced to a science as now—this paper chronicled each in its turn. Following is another of the many items of interest:

"It has been discovered, near Placerville, (Cal.,) that hard clay or cement can be profitably crushed, very much after the fashion of quartz. The cement

mill resembles, but is not entirely like, that designed for quartz. The stamps are lighter and the batteries, instead of discharging the crushed earth on one side, discharge on both sides, thus doing double the work in the same time that it could be done in the ordinary quartz mill."

The above is probably the first mention in the press of the double-discharge mortar, which afterward became popular with silver miners, where the amalgamating was mostly done in pans.

The first labor union in San Francisco, Cal., was organized May 4, 1861. The MINING AND SCIENTIFIC PRESS of May 11, 1861, says of this: "On Saturday last the laborers of the city held a meeting and resolved to work no longer for the ruling rate of wages, viz: \$2 and \$1.75 a day for the ruling rates of time, viz: twelve hours. They consider their services worth \$2.50, and that they should not be obliged to work longer than ten hours every day. The society is organized under the name of the 'Laborers' Protective

MINING AND SCIENTIFIC PRESS.

Our Artistic Heading and New Dress.

herewith, to our numerous patrons, a new face in artistic heading to the MINING AND SCIENTIFIC design is one that must be admired and appreciated for its beautiful execution, style and design. Com- science, Agriculture and Mining are simultane- d with Archimedes pondering over problems. al, the renowned artist of California, pre- ng, and Mr. Armstrong, of Eastman, Loomis the engraver. We feel proud of this head- aps, the best piece of work ever turned

ense expense, purchased new type and of doing our own work, hence its ance. In point of matter, we are n the State, and of such matter f the most important and vital ture, Manufactures, Arts and o execute all job-work and in, or fancy, at the lowest drawings and sketches are s, in the Union. The thanks for the patron- half of this pub- which has for

\$2,500 REWARD.—The Publisher of this journal is hereby au- thorized to offer the above reward to any persons who will place in his hands a successful mode or process for separating the gold from the sulphurets as found in the mines of this State. The reward will be paid in cash, at once, after the tests and experiments shall have been satisfac- torily proved.

The above notice, which has been published by us in the PRESS, has received attention from many of our metallurgists and chemists. A few, however, are in doubt as to the genuineness of the offer. We have to this effect several com- munications from different parts of this State. The pub- lisher hastens to inform those interested to explain, and stip- ulate more particularly the requirements to be complied with. Previously, however, an additional premium is hereby offered, making the reward \$5,000 instead of \$2,500. *The process sought is a successful mode for extracting the various metals, but more especially Gold and Silver from the native Sulphu- rets as found in California.* The treatise should be, how- ever, founded on a paying or remunerative basis. The ma- terials, labor or other expenses in the process should not ex- ceed the value of the metal sought. We have hinted a few suggestions to those who experiment in this process; had we the conveniences we should succeed in discovering this pro- cess. In France, England and Germany sulphurets are smelted. But that process is, doubtless, too expensive in this country,

Fifty Dollars Premium.

The publisher hereby offers fifty dollars for the best writ- ten article on the ORIGIN, DISCOVERY AND SYSTEM of Mining the Pacific Coast. The same to contain correct dates ts, localities, names, etc., not to occupy more than the Press. The above sum will be hall have been print- inferior

NEVADA WATER-WORKS.—The De pipes and other fixtures intended to vada with water, were shipped for Sa per ship Anglo Saxon, which was to delphia about the 25th of October. pected at San Francisco about thr is the intention of Mr. Marsh to to lay down the pipes as soon as some difficulty in hauling such a Sacramento to Nevada, in the calculated that it can be got be farthest, and a few weeks will through the principal streets. The pipes (cast iron) were and the stop gates, hydrants The hydrants, which are t- tween \$700 and \$800.

MINER'S STRIKE.

ners of Dutch Fl: duction of the pr cents an inch

Union." The issue of Sept. 7, 1861, contains the first description of the Plattner process, as it was originally practiced at Frieberg, Baden, Germany. The process differed materially from the process bearing that name to-day.

A hundred other of the early issues of the MINING AND SCIENTIFIC PRESS might be taken up and some interesting paragraph or article taken therefrom; but it is unnecessary. As one turns the pages of these old files, the advance of time sees every new idea, every new application and each new device for the improvement of mining and metallurgical processes chronicled therein. It was then, as it is to-day, promptly to the front with everything that was newest and best in mining. Originally a local paper, circulating principally in California, it has been continually reaching out, until the MINING AND SCIENTIFIC PRESS is known throughout the entire world, and letters received from every country where mining is in progress attest the value and esteem in which it is held by those foremost in the mining industry. No better comparison of the character of the paper and the times can be found than the repub- lished pages of the early editions of the MINING AND SCIENTIFIC PRESS which appear in this issue, and a glance at the contents of the same journal during the past six months. In these pages are found articles contributed by the leading mining engineers of the day, and representatives of mining and metallurgical practice in every part of the world. Following are some of the titles:

"Electric Power for General Mining Purposes;" "Use of Crude Oil in Smelting;" "Steel vs. Timber in Mine Shafts;" "Mine Timbering by the Square Set System at Roseland, B. C.;" "Cyaniding Silver Ores;" "A Dry Process for the Treatment of Com- plex Sulphide Ores;" "A Study of Amalgamation Methods With a View of Avoiding the Loss of Mer- cury;" "Use of Lime as an Alkaline Reagent in Cy- aniding;" "Stamp Milling and Amalgamation of Free Gold Ores;" "Precipitation of Copper Cyanide Solutions;" "Concrete Foundations for Stamp Bat- teries;" "Strength of Materials in Mines;" "Sil- ver Mining and Smelting in Mongolia;" "Winding Plants for Great Depths;" "Boring the Tundra of the Nome, Alaska, Gold Fields in Search of Gold;" "The Permanganate Process for Extraction of Gold from Chlorination Tailings;" "Treatment of Home- stake, South Dakota, Ores;" "Concentration in Cornwall, England;" "Pyritic Smelting;" "Copper Mining in Upper Michigan;" "Elimination of Antimony, Lead and Zinc from Copper Mattes;" "Milling at the Camp Bird Mine, Colo.;" "Late Improvements in Copper Smelting;" "Stopping With Machine Drills;" "Gold Milling Practice in Bendigo, Australia;" "Oil Concentration of Sulphides;" "Separation of Gold from Copper;" "Ore Treat- ment at Mt. Lyell, Tasmania."

These are but a few of the numerous technical articles published within the past half year, and many of them were written specially for the MINING AND SCIENTIFIC PRESS. What may be found in the pages of the MINING AND SCIENTIFIC PRESS within the next forty-three years can only be conjectured. Never

has there been an age in history when progress was so rapid as now. Human thought is far reaching, its conceptions are unlimited, and in these days to think is to act, and innovations as startling as any changes of the past are promised for the future.

Ore Treatment at Mt. Lyell.*

NUMBER III—CONCLUDED.

SUBSIDIARY PLANTS.—An important adjunct to the company's reduction works is the coking plant it possesses at Port Kembla, near Wollongong, New South Wales. This consists of sixty-two ovens of longitudinal horizontal type, 24 feet long by 3 feet 6 inches wide by 5 feet 4 inches high, with circulating gas flues, and a capacity each of about ten tons of coke per week. The works are supplied with com- plete grinding and elevating machinery, hydraulic handling apparatus, including coke pushing machine, and all other necessary paraphernalia, hringing the installation up to date. The small coal used is from the Mount Kembla mine, and prior to grinding for coking is dressed by washing machinery to remove the slate. The coking plant supplies the entire re- quirements of the reduction works, which, in view of the small consumption of coke due to the peculiar method, are comparatively light, and fall below 350 tons per week for the treatment of 7000 tons of metal-bearing material. An excess of output is dis- posed of by sale.

The limestone is napped to a coarse size only. The quantity of stone supplied by the silica quarry from January 1, 1898, to June 30, 1902, is 316,563 cubic yards of crushed, for furnaces, and 12,930 cubic yards of fine, for converters. The output of the limestone quarry for the same period was 155,451 cubic yards of broken rock. Explosives used on silica, chiefly black powder; on limestone, chlorate-nitrobenzol compounds. Typical analyses of these two barren fluxes are the following:

FLUX.	Silica		Iron Oxide		Alumina		Carbonate of Magnesium		Carbonate of Lime	
	%		%		%		%		%	
Quartz flux, white.....	91.44		1.54		3.09		.....		.....
Quartz flux, dark.....	88.72		3.60		7.03		.....		.....
Limestone, grey.....	10.92		.57		2.88		3.00		83.40	
Limestone, black.....	3.26		.85		.86		trace		95.10	

In addition to using the South Tharsis and Royal Tharsis metal-bearing fluxes, the company has lately reverted to the more extensive use of barren quartz flux, chiefly on account of the slackening of deliveries of siliceous ores by the neighboring mines. The supply of natural silica is inexhaustible, for one of the principal rocks of the district, which occurs in very

*From the report of the Secretary of Mines, Tasmania

massive deposits right on the spot, is quartzite, and, failing this, an equally inexhaustible supply of con- glomerate would have been available.

The limestone, though not very pure, serves all purposes for copper smelting, and also makes a good burnt lime. For the latter there are two kilns at the quarry, 18 feet high by 6½ feet diameter. Both quarries continue to constitute the lucky factors, hy way of fluxes, which made their presence, in such close proximity to the smelting works (60 chains), so valuable to the company. The same is also true of the clay deposits in the immediate vicinity of the smelting works which have supplied all the bricks used in the construction of the works (4,000,000), and which the company utilizes for the manufacture both of ordinary bricks and firebricks. The quality of the firebricks is quite equal to ordinary Australian makes, and the price of production considerably cheaper than the local cost of the imported varie- ties, so that the company has given up the use of the latter.

The following table shows the cost of treatment of ore, as collected from the company's half-yearly reports:

HALF YEAR ENDED	Mining		Overburden removal		Smelting		Converting		Total	
	s.	d.	s.	d.	s.	d.	s.	d.	£	s.
March 31, 1897 1	8.27	0	18	1.64	3	10.39	1	5	8.30	
Sept. 30, 1897. 1	4.88	2	0	16	2.44	3	7.78	1	4	3.10
March 31, 1898 2	4.64	2	0	17	9.87	2	9.18	1	4	11.69
Sept. 30, 1898. 2	5.83	2	0	16	5.31	2	5.33	1	3	4.47
March 31, 1899 2	3.66	2	0	16	3.61	1	11.19	1	2	6.36
Sept. 30, 1899. 2	5.31	2	0	17	10.45	2	2.15	1	4	5.91
March 31, 1900 2	11.76	2	0	15	10.70	2	2.30	1	3	0.78
Sept. 30, 1900. 3	5.00	2	0	14	11.89	2	0.29	1	2	5.18
March 31, 1901 3	1.40	2	0	15	9.65	2	1.16	1	3	0.21
Sept. 30, 1901. 2	6.86	2	1	14	8.04	2	0.45	1	1	4.35
March 31, 1902 2	3.89	2	1	14	8.17	2	2.15	1	1	3.21

It has to be remarked that the overburden charge is a nominal one, debited against the winning of ore, irrespective of the actual cost. This charge was determined once for all, when the programme for open cutting was made out, in such a manner as to even up the average of the cost over the total quantity of ore to be extracted. Otherwise the later days of the open cut, when the amount of overburden to be removed per ton of ore would be considerably in excess of what it was in the initial stages of the work, would then oblige the ore to suffer an extreme charge in this respect.

The item of mining comprehends the usual com- plete working expenses, including supervision and management, also the delivery of ore from the open- cut benches to the mine ore bins and similar expenses attendant on or subsequent to excavation, until the smelting department receives the ore. The figures are, therefore, swelled by expenses not necessarily of a mining nature.

The item of smelting similarly comprises the usual

essential costs attaching to the operation itself, such as labor, coke, supplies, stores, hot blast, supervision, electric light, etc., beginning with the sampling of the ore and concluding with the second smelting to converter matte; but it also includes the carriage of the ore from mine bins to smelter storage bins over ropeway or haulage line, the cost of wining and delivering all barren and mineral-bearing fluxes, the maintenance of plant and buildings, the pumping of water supply, all motive power costs, collection and retreatment of flue dust and other middle products, both from the furnaces and convert-

and electrical engineering and languages. Several special lectureships and associate professorships have also been established. Particular emphasis is to be placed upon the study of mining law.

The Cripple Creek Drainage Tunnel.

Written for the MINING AND SCIENTIFIC PRESS by
W. B. WILSON, E. M.

Operations on the drainage tunnel at Cripple Creek, Colo., began early in January of this year,

veyed in pipes over the surface to the workings down the hill, and everything is arranged very conveniently for rapid work.

It is not proposed at present to extend the tunnel any farther than is necessary to reach the main water courses in the eruptive mass occupying the central portion of Beacon hill, as it has been thoroughly demonstrated by the Standard tunnel that all that is necessary to drain the waters from the mines of Raven and Gold hills is to tap the water courses in Beacon. The completion of the tunnel is anxiously looked forward to by all interested in the district,



The Drainage Tunnel, Cripple Creek, Colorado.

ers, all cost of transportation of raw and middle products between the furnace plants and the converters, and, in fact, all incidentals of an operating nature, to which are added cost of laboratory work, telephones and signals, stationery, and general office expenses. Converting is treated with similar fullness. The only item not included in the above figures are London and Melbourne head office expenses, which are slight compared with the rest of the outlay, as well as depreciation of plant. All three departments, moreover, pay the company's railway the usual rates above actual cost of transportation, thus leaving that branch of the company's enterprise a profit. It is, therefore, apparent that the actual mining and smelting costs—i. e., the winning and treatment—as such, are lower than these more comprehensive figures indicate. The cost of shipping and realizing on blister copper is, of course, not included, this not being a local cost.

The mine, smelter and railway departments deal with each other financially as entirely independent concerns, and accounts separately to the Melbourne head office for all transactions. The mine, however, is not treated as selling to the reduction works the ore which it supplies—i. e., the monetary value of the ore is disregarded. This would, under the circumstances, only be a very necessary complication.

The wages paid by the company during the last three years, in the whole of the departments—i. e., mine, reduction works, railway and coke works—have averaged £263,326 per annum.

The number of men employed during the four quarters of the year is reported as follows:

WHERE EMPLOYED	Quarter ending Sept. 30, 1901.....	Quarter ending Dec. 31, 1901.....	Quarter ending March 31, 1902...	Quarter ending June 30, 1902....	Average
Mt. Lyell mine.....	419	426	344	326	379
Other mines.....	46	42	52	50	47
Reduction works.....	1,221	1,300	1,300	1,288	1,277
Railway.....	235	225	220	207	222
Total.....	1,921	1,993	1,916	1,871	1,925

New Mexico School of Mines.

At the New Mexico School of Mines the work of mining engineering will be specialized along three distinct lines. These are the mechanical, the metallurgical and the geological. The last mentioned will form a somewhat new departure in this country and will be known as the special course of the Geology of Mineral Deposits. It will be under the supervision of President Keyes. There will be four instructors in the geological department of this institution.

Scholarships in mining to the number of fifty have been established. The awardment will take place at the beginning of the next semester, early in September next.

There have recently been established at this school the departments of mineralogy and petrography, mining, mechanical engineering, metallurgy, physics

and during the four months which have since elapsed some 2600 feet of tunnel has already been completed. This remarkable rate of progress has been accomplished in the following manner: Beginning at the portal work proceeded in the usual way, but on account of the wash and slide rock encountered only about 82 feet was driven during the first month. About 500 feet from the portal and on the line of the tunnel a shallow shaft 39 feet deep was sunk to the grade and a heading started each way. Then at a point 2300 feet from place of beginning, shaft No. 2 was sunk to a depth of 210 feet and two other headings started off. This shaft was completed last month and work has been vigorously prosecuted since then, some 360 feet or 180 feet in each heading having been driven during the present month. Some 4300 feet from the portal the old El Paso shaft penetrates the line of the tunnel, and with 694 feet of levels already driven, the new tunnel having been surveyed to connect with these workings. These levels have been widened and brought down to the regular tunnel grade and two headings are being rapidly driven. The work is now divided as follows: One heading from the portal, which is now in 1000 feet; two headings from shaft No. 2, 360 feet in all, and two headings from the El Paso shaft, which now have a total length of 1252 feet, making 2602 feet altogether, 1908 feet of which is new work. The rate of progress now is a little better than 30 feet per day, or 900 feet per month, and as the combined distance still to be driven from the various headings before the contact can be broken into is 3200 feet, if the present headway is kept, they should be tapping the water on or before Sept. 1.

It is not likely, judging from the experience of the Standard tunnel, that a very large flow will immediately be struck on entering the eruptive rock, but that from 500 feet to 600 feet farther will have to be driven before the tunnel will begin performing its full duty in the way of giving rapid drainage.

In the accompanying rough sketch there is a great difference between the contact line in the Standard tunnel and in the new drain tunnel. This is apparent, only not real, and is caused by the difference in the hearings of the two tunnels.

The financing of the work was accomplished by the subscribing of the amounts opposite the names of the following concerns:

El Paso G. M. Co.....	\$25,000
Elkton G. M. Co.....	15,000
Mary McKinney G. M. Co.....	15,000
Doctor-Jack Pot G. M. Co.....	5,000
Anaconda G. M. Co.....	4,000
Work G. M. Co.....	1,500
Anchorage-Leland G. M. Co.....	2,500
Moon-Anchorage G. M. Co.....	1,500
Midget G. M. Co.....	1,500
C. K. & N.....	3,500
Taylor & Brunton, sampling works.....	1,000
Tutt, Penrose & McNeill.....	2,500
Midland Railway Co.....	2,500
Sale of water right.....	5,000
Total.....	\$85,500

The contract for driving the tunnel to the contact was let to the El Paso Mining Co. at an average price of about \$14.50 per foot. They having the equipment right on the ground permitted their making a very reasonable bid. The compressed air from the compressor at the El Paso shaft is con-

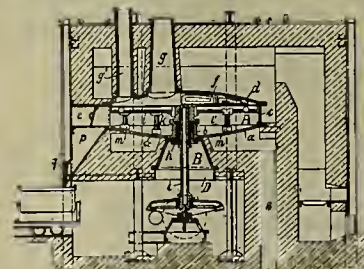
and there can be no doubt of the great benefit which will be derived from it when the water begins flowing out of its portal.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 12 1903

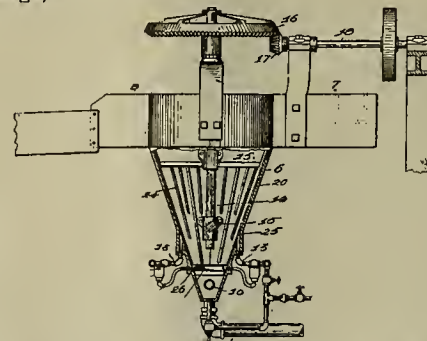
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

CALCINING OR DECOMPOSING FURNACE.—No. 726,911; W. Hasenhach, Mannheim, Germany.



Calcining or decomposing furnace comprising iron framework, hollow casting mounted on framework for supporting muffle and serving as bearing for shaft of agitator, muffle supported on casting and having inner hub, agitator within muffle provided with hub fitting over hub of muffle, shaft for agitator having bearing in hollow casting, and means for operating agitator.

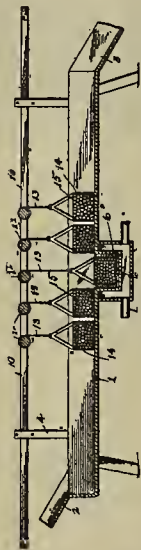
ROTARY ORE CLASSIFIER.—No. 727,973; J. Klein, Desloge, Mo.



In ore classifier, hopper having ore inlet and sludge outlet, water inlet arranged to discharge stream of water in horizontal plane at distance above bottom of hopper, air pipe arranged to discharge stream of air laterally of and into stream of water from water inlet, annular amalgamating trough in plane above water inlet, pipes extending outwardly from trough at various points in circumference, amalgam cups connected with pipes, and

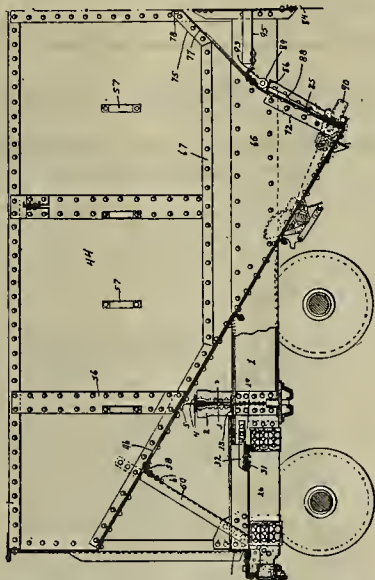
amalgamating plates located above trough with lower ends terminating adjacent thereto.

AMALGAMATING DEVICE.—No. 726,997; G. C. Scott, Columbus, Ohio.



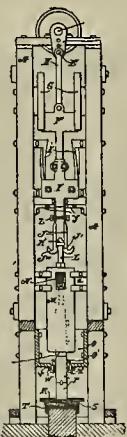
Combination with ore pulp receiving vessel having offset or well in lower side adapted to contain body of mercury, amalgamating bodies contained within vessel, movable support for amalgamating bodies above vessel and means connected with support for raising and lowering amalgamating bodies independently.

HOPPER CAR.—No. 727,616; J. M. Hansen, Pittsburgh, Pa.



In metallic car body, combination with side plates, of cross-hood consisting of two downwardly diverging plates provided with abutting flanges at upper edges, connection plates secured between abutting flanges, connection plates secured to side plates of car, and inclined ties secured to connection plates on sides of car and connection plates of cross-hood.

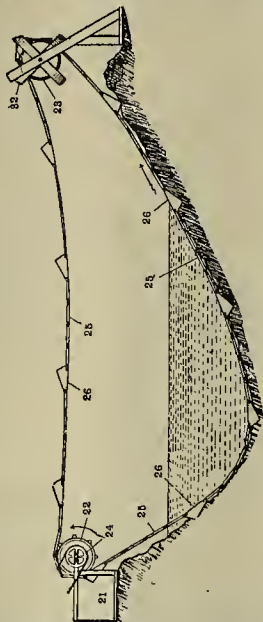
STAMP MILL.—No. 727,809; C. C. Lane, Los Angeles, Cal.



Stamp mill for crushing ore comprising frame, shaft mounted in top thereof, crank-arm on shaft, pitman connected to crank-arm, vertical guide connected to pitman, spiral guide rotatably connected to vertical guide, resilient gripping prongs affixed to spiral guide, having catches on inner faces, and out-

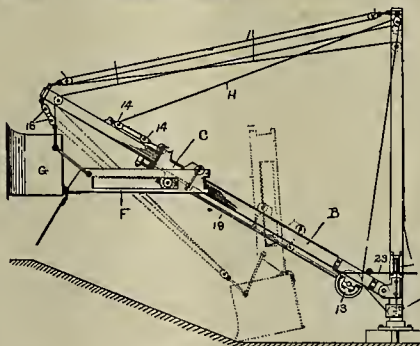
wardly and upwardly turned release hooks on lower ends, release bars affixed to frame, adapted to contact with release hooks, release stamp therefrom on upward movement, stamp head having at one end upwardly projecting stem provided with conical head and removable shoe in end opposite stem, and mortar having removable die projecting through bottom thereof, means to support and adjust die to compensate for wear.

GRAVEL OR SAND DREDGE.—No. 727,632; R. Hosford, Lebanon, Ind.



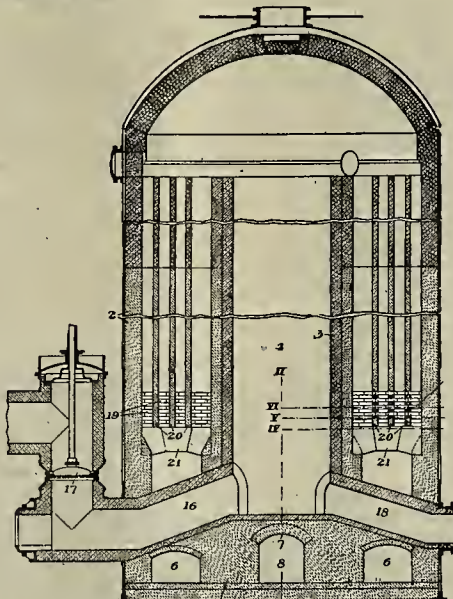
Combination two suitable frames, driving wheel mounted on one, idle wheel mounted on other, and dredge and conveyor structure composed of open links 25 and 26 mounted thereon, links 26 being wider than links 25 one end and having inclined cross members whereby they are enabled act as buckets in dredging and conveying operation.

EXCAVATOR.—No. 727,656; W. E. Maloney and P. J. Maloney, Worcester, Mass.



In excavator or power shovel, combination of boom or arm, bucket, hoisting tackle connecting bucket with end of boom, carriage longitudinally movable on boom for swinging bucket, and gearing housed in carriage for tipping bucket.

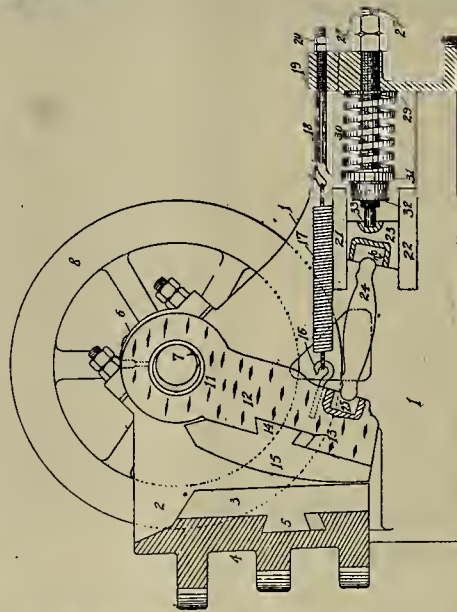
HOT BLAST STOVE.—No. 728,185; J. Kennedy, Pittsburgh, Pa.



Hot blast stove having lower annular flue with

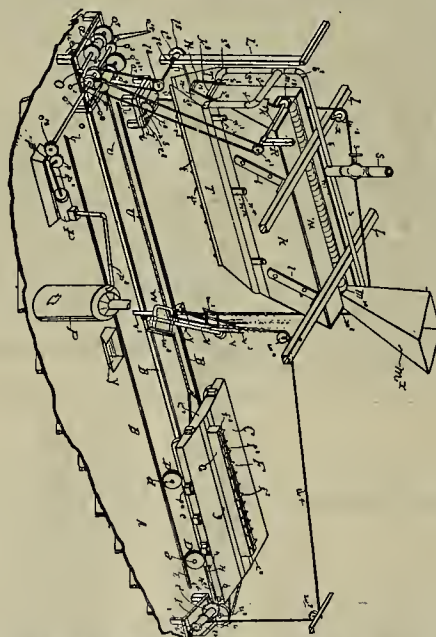
central arch containing cross flue connecting opposite sides of annular flue, central combustion chamber with lower end over arch, gaseous inlet and hot-blast outlet leading into lower end of combustion chamber, radial checker work around combustion chamber and opening downwardly into annular flue, flue having chimney outlet and cold-blast inlet leading into it.

ORE CRUSHER.—No. 727,958; J. A. Johnson, Los Angeles, Cal.



In ore crushing machines, frame end thereof provided with dovetailed groove, crusher bed having dovetailed tongue adapted to be removably secured to end of frame, drive shaft mounted in frame, arm secured to shaft and having dovetailed slot therein, movable jaw removably fastened to arm, adjusting rod adjustably mounted in frame, spring detachably connected to rod and to rear face of arm and means adjustably connected to rear end of frame, limiting rear movement of arm.

ORE SEPARATING AND CONCENTRATING APPARATUS.—No. 727,997; F. E. Parker, Kansas City, Mo.



In ore separators, combination with main, elevated, longitudinally extended receptacle or trough for reception of material to be separated, having perforate bottom and perforate sliding, feed-regulating plate within and upon upper surface of bottom of receptacle, perforate material-conveyor box in main elevated receptacle, means for operating conveyor, water spraying pipes on each side of main receptacle, and suitable water deflecting plates beneath pipes. Reciprocally traveling table, pendent material removing devices in path of upper surface of table, and suitable hanging supports therefor, and devices actuated alternately by table in its to-and-fro movement coating with material removing devices and imparting intermittent motion thereto transversely to line of direction of movement of table.

METHOD OF EXTRACTING NOBLE METALS.—No. 727,659; F. W. Martino, Sheffield, Eng.

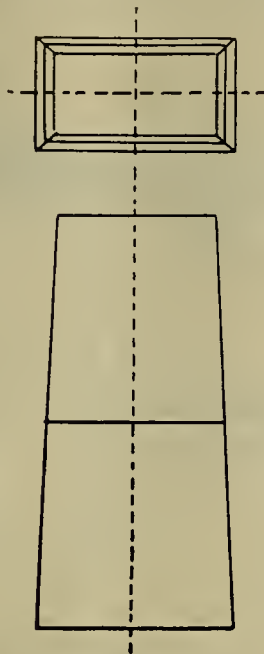
Recovering gold from cyanide solution by acidifying solution and treating it at raised temperature with barium sulpho-carbide.

Head-Works Framing—Primary Notions.

Written for the MINING AND SCIENTIFIC PRESS by
CHARLES H. FITCH.

If we have over a shaft a rectangular tower of timbering having four legs or struts, and assume it to be centrally loaded with 80,000 pounds, each corner post will take one-fourth of the load—that is, 20,000 pounds.

A skeleton sketch of such a tower is shown herewith, sides at top 6 feet and 12 feet, at bottom of sec-



ond section 7 feet and 14 feet, with sections 15 feet high.

This gives the corner posts a batter or inclination of practically 2° from the vertical. The vertical load being 20,000 pounds, the slightly inclined post will take that load; but the stress caused in the post will be greater than the load. The stress in the inclined strut or post will be equal to the load into the secant of 2° , which will be a little (less than 100 pounds) more than the load of 20,000 pounds.

The stress will, however, be more than the vertical load, and, if the strut were more inclined, the excess of stress would be much greater. A toggle joint furnishes a practical illustration of this, as it has links which assume variable angles with the direction of pressure applied to them, and, as these angles become oblique, the stress in the links and the pressure which they exert become very great, which fact gives value to the construction as a machine detail for stone crushers, presses and the like. This stress varies as the secant of the angle with the direction of the original pressure taken as a unit or denominator.

If we make a right-angled triangle, in which the vertical pressure of 20,000 pounds is represented by the vertical side, and draw the line of direction of strut (2° from the vertical or other angle, as the case may be), until it intercepts the horizontal side, the hypotenuse or oblique side will represent the stress in the strut. When we call it the secant this is what we mean.

The horizontal line will represent a stress needed to balance the triangle of forces. Whatever the angle be it is called the tangent, and we find these dimensions for any angle or pressure by referring to tables of natural circular functions and multiplying the ratios found by the pressure, load or stress which is made up by other stresses in members, taking the directions of secants and tangents.

If we had a member of the frame in the position of the tangent, we would thus have observed the stress in it, as well as in the strut, and we would have to provide a section of timber to meet the strain.

But our frame has no member in the direction of the tangent of the angle of inclination of the strut with the vertical. If we draw such a tangent, it is the projection vertically downward of the inclined strut upon a horizontal plane. The structure has no such line, but joining the corner posts at the top are horizontal members which hold them together. It is easy to see that some of the vertical load applied to each inclined corner post comes upon the adjacent horizontal members. The stresses in them are small; but if they offered no resistance the strut would fall over. There is a push on both of these members, and there is nothing else to take this push. It is exactly represented by the tangent which we have already laid out.

We have already determined the value of that tangent in pounds load, and we have its direction. If we now lay off a line parallel with one of the horizontal members from one end of the tangent, and a line parallel with the other horizontal member from the

other end of the tangent, a new triangle will be formed, in which the triangle will be the hypotenuse. The lengths of the sides will give the stresses in the horizontal members at top due to each corner load. These we obtain in figures, which save us from laying off and measuring by using tables of sines and cosines.

In the tables of secants and tangents one side of a right-angled triangle is taken as the unit. In the tables of sines and cosines the hypotenuse of a right-angled triangle is taken as a unit.

In the case of the tower sketched, one of the top members makes an angle of $26\frac{1}{2}^\circ$ with the tangent. Stresses are as follows, due to each vertical corner load:

- In strut—
 $20,000 \times \secant 2^\circ$.
- In one horizontal member at top—
 $20,000 \times \tangent 2^\circ \times \sin 26\frac{1}{2}^\circ$.
- In the other—
 $20,000 \times \tangent 2^\circ \times \cosine 26\frac{1}{2}^\circ$.

These latter stresses, due to two-corner loads, figure out at about 600 pounds and 1400 pounds, respectively.

We have to provide cross-section of timber enough to meet all the stresses coming upon a member. For the next lower section the weight of the section above it must be figured; but the foregoing indicates the method of locating stresses and members to withstand them by the triangle of forces. If we have a pressure in one direction coming upon three members in as many directions, it is a simple matter of measuring the angles and determining the stresses by use of tables of circular functions.

In any framing a pressure is resisted with greatest economy of material by a strut in direct line with it; but as the framing usually needs to leave center lines for other purposes, and because a variety of pressures have to be considered, the lines of framing are usually placed at some disadvantage with reference to the direction of any particular pressure considered.

For example, besides the weight pressures, we have often to consider wind pressures. These are relatively much lighter in most cases; but, because the framing members of a structure are usually placed to resist the loads of weight chiefly, their direction is unfavorable for resistance to wind pressures. Hence it is often found that these minor wind pressures create very heavy pressures in some members not favorably placed to receive them, which stresses, all the same, have to be carefully provided for by increasing the dimensions of such members.

A straight line is the shortest distance between two points, and, in carrying a stress between two points, indirection involves additional size and strength.

The calculation of stresses in tower frames is less easily grasped than calculation of elements of bridge trusses, because they are in space of three dimensions, instead of being in a plane of two dimensions. Hence, they must be calculated in two planes at right angles. This is easily seen by using a card model showing the lines as edges of the card, and bending the card to show the planes.

I have made these primary explanations in the attempt to give some practical understanding of the stresses in tower frames to anyone who has not studied trigonometry, and as a prelude to further explanations. Tables of secants, tangents, sines and cosines may be found in many books—usually in any engineering pocketbook. The angles may be laid off and measured with a protractor.

Safe loads for yellow pine struts are:

	8"x8"	10"x10"	12"x12"
	Pounds.	Pounds.	Pounds.
12 feet long.....	60,000	100,000	140,000
24 feet long.....	40,000	80,000	120,000

By allowing a strength about proportional with the square inches area of cross-section, and using reasonable lengths of timbers, a pretty good approximation to the sizes required can be had for any ordinary case. This may prevent the use of the needlessly heavy timbers often seen in head-works, and will have a basis of good theory and not be mere guesswork.

Electrolytic Refining of Gold.

Dr. D. K. Tuttle gives an illustrated description in the January impression of *Electrochem. Industry* of the Wohlwill process of gold refining used at the Philadelphia United States Mint. The feature of the process is the electrolyte, which is composed of a gold trichloride solution, rather strongly impregnated with free hydrochloric acid; the latter addition is necessary, because if a gold anode be placed in a neutral or only slightly acid solution of gold chloride, gold will be deposited on the cathode, but little or no gold will be dissolved from the anode, free chlorine being given off instead. The temperature of operation is 50° to 55° C., this increased temperature serving to reduce the voltage required, and at the same time to diminish the amount of free acid necessary to suppress evolution of chlorine at the anodes. Circulation of the electrolyte is also necessary. The cost of the hydrochloric acid required in the bath is 20 cents per 1000 ounces of deposited gold. Any platinum present in the bullion can be recovered; it dissolves, but is not deposited with the gold. When the electrolyte becomes sufficiently

charged with platinum, the gold is first precipitated by sulphur dioxide and reserved; then the platinum remaining in solution is separated as ammonium-platinum chloride; lastly the copper is recovered by passing the wash waters over iron scrap. He does not treat by this process bullion having a fineness of less than 940 gold.

The Commercial Assay of Lead Ores.*

Written by A. W. WARWICK.

No one familiar with the methods in vogue for the commercial assay of lead ores can feel at all satisfied with them. The fire assay is so inherently inaccurate that it is a wonder that the sellers of such ores have not made an organized resistance to the valuation of lead ores by such a method. It is utterly unscientific, and it seems to some members of the Scientific Society that it might well be the subject of investigation by us.

It is, of course, well known by the members of this Society that two methods of lead assay are practiced in the West: the barbarous fire assay—a relic of the times when Paracelsus and other alchemists were leading lights of science—and the volumetric method, based upon the precipitation of ammonium molybdate, and known sometimes as Alexander's method. This latter is an excellent one, being rapid and accurate enough for all commercial purposes.

Both these methods are being used by the smelters, care being taken, however, to use the method which gives the lowest results. Thus, the ores of Brece hill and the Lillian mine are assayed by the volumetric method, on account of the ores (containing bismuth) giving lower results than the fire assay. All other ores are purchased on the valuation set by the fire assay.

It is notorious that the fire assay for lead ores becomes increasingly inaccurate as the ores become more complex and of lower grade. Thus, ores containing 8% of lead, by chemical analysis, may not show more than 4.5% to 5% by the fire assay—an error of about 40%. The writer has caused a number of comparative tests to be made as to the results obtained by both methods of assay, and the figures are decidedly interesting.

The ores assayed from 5.7% lead to 20.6% by the volumetric process, and the composition of the ores treated had analyses which varied between the limits given below:

	(1)	(2)
Pb.....	5.7.....	20.6
Zn.....	10.1.....	23.8
Fe.....	5.0.....	8.4
SiO ₂	64.2.....	27.8

The analyses gave the following comparative results by volumetric and fire assays:

	Volumetric.	Fire.	Difference.
1.....	6.4.....	4.8.....	2.1
2.....	5.7.....	3.8.....	1.9
3.....	10.1.....	8.6.....	1.5
4.....	10.5.....	9.5.....	1.0
5.....	12.6.....	10.9.....	1.7
6.....	10.7.....	7.8.....	2.9
7.....	20.6.....	17.6.....	3.0
8.....	9.8.....	6.3.....	3.5
9.....	7.4.....	4.8.....	2.6
	10.4	8.3	2.1

It will be noticed that the difference between the fire and volumetric assays vary so greatly that it amounts to a farce to call the fire assay a determination of lead.

It is not, however, merely a question of a loss of 2.1% of the lead contents that is involved, but also the entire contents of certain lots, viz.: 1, 2 and 9, these being below the specified amount of 5% paid for by the smelter. As usual, the ores which need the most consideration get the least.

The smelter men argue that the assay gives the yield that is obtained in practice, and therefore it is a fair method of valuation. This is absolutely false. Some of the members may recollect that the smelters brought forward a similar argument when the question of copper assaying was a live one, some ten or twelve years ago. It was proved to be incorrect for copper, and the writer, for one, believes that the same is true for lead. As a result of the copper debate the smelters were forced to yield, and a rational process of assaying that metal was adopted.

It may be interesting, however, to point out that the prices paid the miner for the lead contained in the ore are so low that the profit of the sales by the smelter must more than cover any loss. For example: On ores assaying 5% to 10%, fire, the price paid by the smelter is 25 cents per unit, or 1.25 cent per pound. The smelter gets 4 cents per pound, and hence he has 2.75 cents per pound to cover refining and transportation to New York. This presumes, of course, that he only gets as much out of the ore as the fire assay shows. On the actual lead contents of the ores bought by the smelters he may pay as little as 0.7 cent per pound, leaving the difference of 3.3 cents to pay for the losses, as well as the other items mentioned.

* Proceedings of the Colorado Scientific Society.

New Plant of the Royal Consolidated Mines Co., Ltd., Hodson, Cal.

Written for the MINING AND SCIENTIFIC PRESS by
HORACE F. BROWN, M. E.

This plant, now nearing completion, represents the growth of the mining industry of California to a notable degree. The old plant of forty stamps has a record for successful work.

The recent improvements consist of a modern 120-

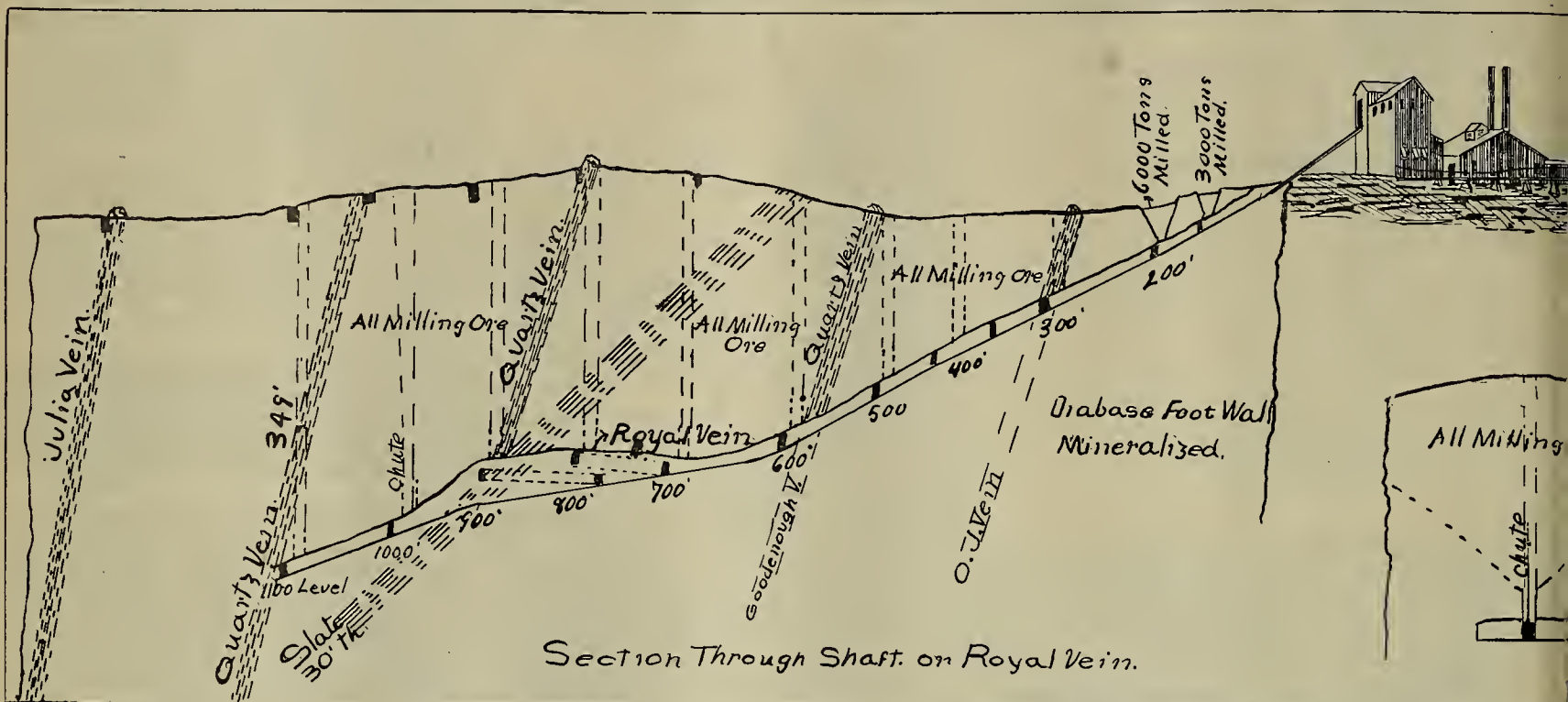
a capacity of four tons and weighing 3700 pounds, are provided for tramping the ore to the mill. These cars are operated by an electric mine locomotive, trolley driven, which gives a capacity of about 100 tons per hour. The locomotive is provided with a headlight and the whole plant is electrically lighted, so that ore can be delivered either night or day if required.

The tramway consists of trestle work, starting from grade from the crushing plant, running up an incline of 1½% to the top of the storage bins in the mill. The maximum height of the tramway is 54 feet;

2 feet 6 inches thick, 12x12 feet square, built on solid rock. The mortar and battery bolts pass entirely through the concrete base to heavy anchors.

The battery frame is tied to the framing of the ore bin, as shown in the cross section of the mill herewith, making an exceedingly rigid and substantial construction. Each battery is also fitted with copper plates 52 inches wide by 24 feet long. This length is somewhat excessive, but it has been adopted by reason of long experience on the ore of the Royal mine.

The mill and crushing machinery were furnished by



Cross-Section Royal Con. Mine, Hodson, Cal., Showing

stamp, wet-crushing gold mill, a new crushing and hoisting plant at the mines and an electric tramway from mine to mill.

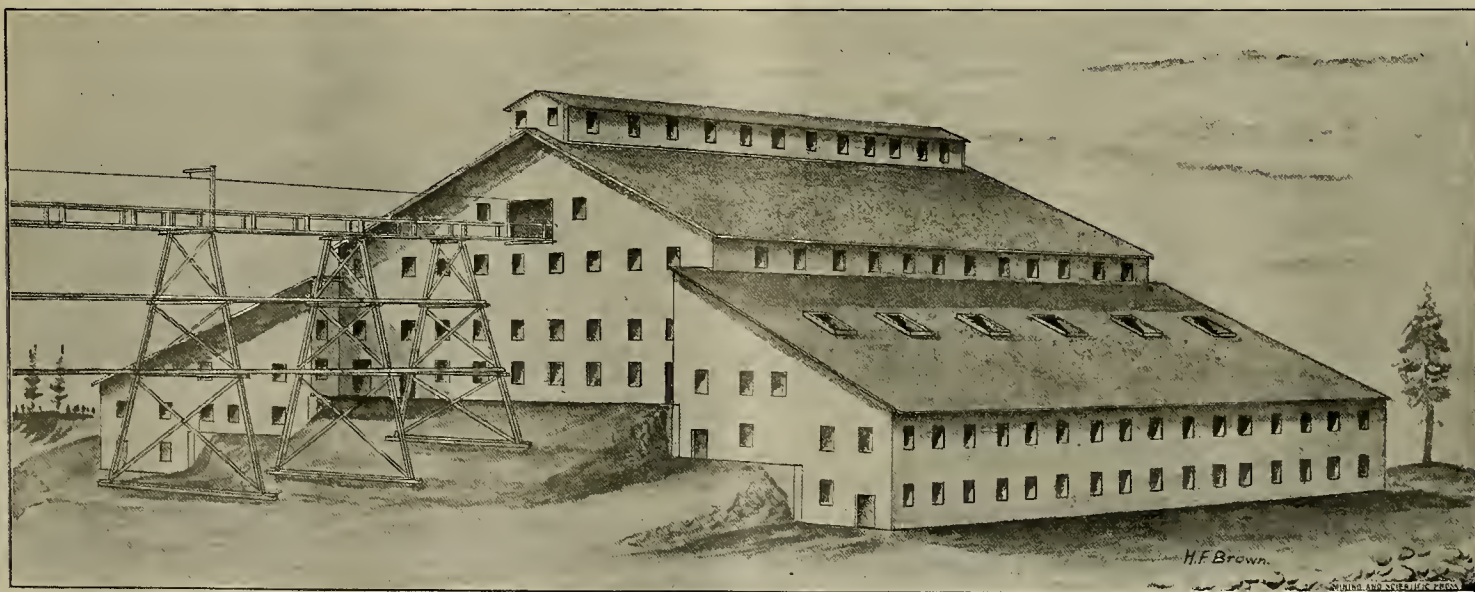
The hoisting plant consists of a powerful double-drum hoist, operated by two 12x14 high-pressure engines, having a hoisting speed of 800 feet per minute, the skip having a capacity of four tons. The ore is dumped directly to the hopper of a No. 7½,

average height, about 38 feet; length, 1600 feet. The track is of 30-pound steel rail, 24-inch gauge. The cars enter the mill near the apex of the roof and discharge to double-storage bins below, which have a capacity of about 1000 tons.

The mill is located on the crest of a ridge 1600 feet from the collar of the shaft and about 15 feet below the level of the same.

the Allis-Chalmers Co. of Chicago, Ill., and represents all of the latest improvements in stamp mill construction.

The concentrating machinery consists of twenty-four Standard tables, furnished by the Llewellyn Iron Works of Los Angeles, Cal., and twelve belt concentrators, for second concentration, of the vanner type. All of the middlings from the twenty-four Standard



Royal Con. 120-Stamp Mill, Hodson, Cal.

style D, Gates gyratory crusher, where it is all crushed to pass a 2½-inch ring. This crusher has a capacity of 125 tons per hour. All the ore from the primary crusher passes through a revolving screen, where all of 1-inch cube and under is taken out, the balance going to two No. 4½, style D, Gates crushers, where it is all reduced to 1-inch cube or less, all of the material, when reduced to the proper size, being raised to storage bins by means of a belt elevator. The elevator is 64 feet between centers, and has an 8-ply belt 34 inches wide, with heavy steel ore buckets 15x30 inches. The storage hoppers of the crushing bin have a capacity of about 150 tons.

Four steel cars of the side-dump type, each having

There are two lines of stamps arranged back to back, twelve batteries of five stamps each in each line. Each battery is driven by separate pulley, and each unit of four batteries is driven by an independent 50 H. P. General Electric motor, having a speed of 692 revolutions per minute, loaded, and 720 revolutions per minute, light. Each battery is fitted complete with steel cams and tappets, and an overhead Challenge feeder, sectional stamp guides, etc. Weight of stamps complete, 1050 pounds; drops per minute, 106.

The mortar blocks are of concrete, 6 feet 6 inches high above the base, 4x5 feet on the top and 8 feet at the bottom, each pair of blocks resting on a base

tables will pass over the twelve belt concentrators, insuring a high saving.

The tailings from the north side of the mill are carried through a tunnel to the south slope of the hill, where practically an unlimited dumping ground is available, while the tailings from the south side of the mill flow out in an open sluice. All of the tailings can be impounded and it will take years to fill the available ground.

The entire framework of the mill, hoist, crusher house, tramways, etc., is of Oregon fir, shipped direct to Milton, the railway terminus, 12 miles from Hodson.

One striking feature of the mill is the concrete re-

Tonopah, Nev., May 18.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

J. N. Tisdale, superintendent of the Snettisham mines at Snettisham, says he has fifty men at work. The snow does not interfere, as the works are near the beach and the snow recedes early.

At the Sheep Creek mine, near Juneau, an air compressor is being put in.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—The shaft of the Dragoon C. M. & S. Co., operating in the Dragons, is down 235 feet. At 230 feet carbonate ore of good quality in white lime rock was struck. Indications point to the uncovering of a body of ore.

Pearce, May 16.

Superintendent P. L. Dwight says operations will be resumed on the Bisbee West mine, near Bisbee, which has been closed down for three months. An engine will be put in and thirty men put to work.

Superintendent C. Cunningham has men at work on the Anaconda & Arizona mine near Bisbee.

The Headberg group of thirteen claims has been sold to Michigan men, with E. Ryan of Calumet, Mich., manager. The group of claims is west of the Wolverine and Arizona groups, near Bisbee.

GILA COUNTY.

(Special Correspondence).—The Pacific M. & M. Co., J. B. Copen, manager and treasurer, and J. D. Copen, superintendent, have bought the Clipper group of copper mines, 7 miles west of Globe, and adjoining the Finletter & Harvey group. The price was over \$100,000, 10% cash being paid down. The Pacific Co. is composed of Denver, Colo., and Kansas City, Mo., men. Manager Copen also took a bond on five adjacent claims.

Globo, May 17.

The pumps and machinery at the Malory shaft, on the Globe-Boston group, near Globe, have been overhauled, and they are cutting the station and will start the crosscut at depth of 450 feet in the shaft.

MARICOPA COUNTY.

The owners of the Black Hawk mine, south of the White Tank mountains, near Buckeye, are building a 10-stamp mill at Buckeye, 7 miles distant. Development work in the mine is down 160 feet, and ore is being stopped.

The Relief G. M. Co., G. Hamlin manager, will build a plant capable of reducing fifty tons of ore daily. Their mines are 22 miles northwest of Phoenix.

H. Slusher is reported to have bought the Wiggins interest in the Anglesite mine, near the Ryland mine, near Wick-enburg.

MOHAVE COUNTY.

It is reported Superintendent Nellson and G. W. Jonas of the Standard G. M. Co., who have been prospecting in the Chemehuevi mountains, south of Kingman, have found an 8-foot vein carrying values in gold. It is 20 miles south of Franconia, on the Santa Fe Railroad. The company has been at work on a number of claims in Mohave Wash, at south end of the range.

PIMA COUNTY.

The Tucson S. & R. Co. have bought the Copper King group of mines, 14 miles southwest of Tucson in Tucson mountains, says the Bisbee Review. They will build a smelter. In one of the main tunnels they have a body of ore that runs 20% in copper. W. W. Robinson is manager.

The Catalina C. M. Co., operating the Catalina group of mines in the Catalina mountains, near Tucson, are putting in a pump, hoist and drills, and intend to erect a smelter. They report having blocked out a body of sulphide ore averaging 7% copper, \$2 in gold and \$2 in silver. There are fifteen claims in the group and F. M. Hartman is manager.

The Old Pueblo C. Co. has organized at Tucson to develop a group of claims owned by H. E. Crepin, A. Rossi et al., 4 miles west of Tucson, in the Tucson mountains. W. P. Haynes is interested. The ore carries values in copper, gold and silver. A 4-foot vein of shipping ore has been opened up at depth of 85 feet, says the Tucson Post.

The Tucson smelting works are reported to have bought 160 acres of land for the location of their works, 3 miles south of Tucson, on the west side of Santa Cruz river.

PINAL COUNTY.

(Special Correspondence).—The Troy-Manhattan M. Co., near Troy, have fifty

men at work. The J. F. McSherry group of twelve claims have been sold to an Omaha company. This group is about 1 mile west of Kelvin and north of the Gila river, the ore carrying values in gold and silver with a percentage of copper. There is considerable activity in mining around Kelvin at present. The Phoenix & Eastern Railroad will be completed to Kelvin by next fall, and it is reported the Ray copper mines will resume when the railroad is finished as far as Kelvin or Riverside.

Kelvin, May 15.

YAVAPAI COUNTY.

The Niagara Copper Co. incorporated last week at Prescott—H. Voge, J. P. Bauder and N. Levy. The Niagara group of nine claims is near the Hillside mine, near Hillside. The values are copper, gold and silver. Some native copper is obtained.

An eighteen months' bond has been given to B. R. Miller et al. on the D. E. Dumas group of copper and gold claims, 12 miles northeast of Jerome, on Sycamore creek, says the Courier.

The Josephine M. Co., which is developing the Black Lode mine, in Hassayampa district, near Maxton, are putting in machinery for deep workings, including hoist, engine and boiler. Drifting has started from the bottom of the 100-foot shaft. The vein is 15 feet wide, the ore carrying values in copper and gold.

YUMA COUNTY.

Superintendent J. A. Rivers of the Success C. M. Co., at Quartzsite, says they will build a smelter. The Success Co. is composed of Los Angeles, Cal., men.

CALIFORNIA.

AMADOR COUNTY.

Superintendent W. R. Thomas of the Central Eureka mine, near Sutter Creek, in his annual report for the fiscal year ending April 1, 1903, shows 43,545 tons of ore were milled, against 21,785 tons for 1901-02. The shaft is 2160 feet on the incline, with a wide vein at the bottom. Most of the ore worked during the year came from the 1900-foot and 2000-foot levels. The cost of mining and milling for 1901-02 was \$4.47 per ton, while for 1902-03 it came under \$3 per ton. Following is an itemized statement:

Total ore milled during the year,	tons.....	43,545
43,545 tons of ore yielded in free	gold.....	\$213,421 17
1283.8 tons of sulphurets yielded		48,481 83
Total		\$261,903 00

Average value in free gold per ton.	\$4 901
Average value in sulphurets per ton	1 113
Average assay of tailings per ton...	0 485

Actual value of ore.....	\$6 499	
Average net value in free gold per	ton.....	\$4 866
Average net value in sulphurets per	ton.....	0 865

Total net value, after deducting	cost of refining bullion and reduc-	tion of concentrates.....	\$5 741
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Quicksilver fed inside batteries, ozs.	18,492	
Average yield per ounce of quick-	silver fed in free gold.....	\$11 49
Amalgam cleaned up, ozs.....	33,612	
Average yield per ounce of amal-	gam.....	\$6 314

Cost of mining, per ton.....	\$1 795
Cost of development, per ton.....	0 519
Cost of milling, per ton.....	0 490

Total cost per ton.....	\$2 804
Bullion produced to date.....	\$661,527 44

During the year the mill was idle thirty days, owing to electric power being shut off; twenty additional stamps were completed and an air compressor and four more machine drills put in.

CALAVERAS COUNTY.

The Lightner mine at Angels is closed, to retimber the shaft from the 300-foot level to the surface.

A mill is being put up on the Shepard gravel mine at Banner mills, near Sheep Ranch.

It is reported the Pioneer Chief and Illinois mines, southwest of San Andreas, will begin operations June 1st.

The Oriole mine, near Angels, reports a satisfactory clean-up last week. During the past thirty days 1897 tons of rock have been put through the 10-stamp mill. The shaft is down 647 feet and in excellent milling rock; at the 500-foot level the south drift is run 500 feet, the north drift being 400 feet, with crosscutting east on the south drift. On the 600 level the south drift is 400 feet in milling rock, the sulphurets going \$50 per ton. At the 200 level work is also being done.

EL DORADO COUNTY.

H. Anderson of San Francisco last week bought the Sunshine mine for \$5000; also the Lee mine in Greenwood district, near Greenwood, for \$10,000. Both are quartz mines. Anderson owns four mines in that district, including the California Jack.

KERN COUNTY.

The United States Supreme Court has rendered final judgment in the "scripper" case of Clarke et al. vs. the Kern Oil Co., and other cases involving the same questions and rights. The Kern Oil Co. and other mineral proprietors are confirmed by the judgment in their ownership of oil lands against the claims of Clarke et al., who, by filing entry, sought to take up the lands as agricultural lands, in lieu of forest lands which they gave up. The decisions of the lower courts and of the Secretary of the Interior and Commissioner of the General Land Office are confirmed. One important point finally settled by the case is that petroleum lands are mineral lands under the mining laws of Congress.

The Webber Oil Co. has incorporated at Bakersfield with A. A. Webber, H. F. Peart, W. V. Doughty, E. A. Clausen and J. A. Marsh, directors.

NEVADA COUNTY.

The Hibbe G. & C. M. Co. has incorporated at Salt Lake City, Utah, to operate a group on Bear river, near Sheridan, Placer county. H. Hibbe is manager. W. H. Karchner, J. Petres, J. French, G. Greltman, H. J. Kempton, M. E. Leahy, V. M. Curtis, W. L. Grubbs, W. P. Adams, E. T. Maxwell, T. J. Cunningham, H. Booth, Salt Lake City, Utah, are incorporators.

D. Johnson and M. R. Vernon of San Francisco have bonded the Rocky Glen mine, 1 mile from Graniteville, for Leavenworth, Kan., men. Development work will begin next month with Vernon as superintendent. A compressor and machine drills are to be put in and as soon as the tunnel has been run a mill will be built.

A 500-foot tunnel will be started next week at the Alta-California gravel claim, near Nevada City, which is under bond to Root & Heisner.

It is locally reported the California mine on Deadman's Flat is bonded by W. C. Adams for an Eastern company for six months for \$30,000. The mine adjoins the Seven-Thirty and is near the Standard, which is being developed. It is 3 miles southwest of Grass Valley. The shaft is down 280 feet, and is equipped with a hoisting and pumping plant, in addition to a 5-stamp mill.

Superintendent C. E. Wodell at Shady Creek, between Grass Valley and North San Juan, says he has men at work to develop a group of claims bonded by H. Drescher and C. L. Canfield of Sacramento. The tailings that have accumulated in the creek will be worked over until the bed of the old stream is reached. A ditch and pipe line will be built, and means for elevating the tailings out of the creek provided.

The Mountain Maid mine at You Bet is temporarily shut down.

Superintendent Kartschoke of the St. Gothard mine at Columbia Hill, near Grass Valley, reports development work progressing. Additional machinery is being placed, including an engine and pump which will be used to unwater the 1000-foot level, at which depth a body of ore was opened last year.

H. Kaler, superintendent of the Gray Eagle mine, at Washington, says the tunnel has been driven in 388 feet. The 10-stamp mill will be in operation next week. A flume is being built to carry the water for power. While excavating for the mill they uncovered a ledge of rock that was not before known to exist, showing an average value of \$30 per ton.

PLACER COUNTY.

Superintendent J. B. Hanna of the Barton mine near Auburn says he has twenty-two men at work and development will be increased.

Men are at work at the Crater mine, near Auburn, cleaning out the shaft to reach a 3-foot ledge in the lower tunnel. F. D. Hussey of Louisville, Ky., who has an eighteen months' bond on the Crater, is preparing to prospect the adjoining Kittler and Walsh claims.

SHASTA COUNTY.

Near Shasta free gold ore is reported found which is thought to be the source of the placer gold of Middle creek, Salt creek and Rock creek.

The Shasta Mountain C. Co. has sold to A. Onn its Spread Eagle group of quartz mines in Flat Creek mining district, near Redding.

Final payment is reported made by the Mount Shasta G. M. Corporation on the Pioneer G. & S. M. Co. (McClure) group of mines, adjoining the DeLamar Bully Hill

mines, near Winthrop; H. C. McClure of Los Angeles is superintendent.

The Bennington group of nine claims (Little Nellie group), near Iron mountain, near Keswick, have been bonded to E. H. Scott of Pittsburg, Pa., for \$18,000.

At the Bully Hill mines, at De Lamar (Winthrop), the converters in the smelter are running two shifts, and bullion shipments have begun. On the 12th inst., a day's run of one furnace on the black ore recently opened on the 570-foot level yielded forty-two bars of copper bullion, carrying values in gold and silver, says the Redding Searohlight. By the end of this week it is expected to have both mine and smelter in full operation, says Superintendent Keating.

The Evening Star mine in Old Diggings district, near Redding, is in operation.

SISKIYOU COUNTY.

(Special Correspondence).—The Yreka M. & M. Co. have their 20-stamp mill running steadily on ore from the Mountain Laurel and Aida claims. The ore from the Aida is carried to the mill by an aerial tram, and averages \$6 per ton. The ore in Mountain Laurel claim is higher grade. Improvements are proposed this summer, including the addition of power drills, cyanide plant and enlargement of the mill. A. J. Ball, part owner of the Ida May mine, near the Mountain Laurel, will begin grading for his mill next week. R. L. Fagundes' mill at Rollin is running steadily, crushing custom ore. Many prospectors are coming into the Salmon River country for spring work. All the mines and mills in this section are taking advantage of the supply of water and are running full blast. The water season will last two or three months yet, according to the altitude and location of the mines. There is still a scarcity of good miners in this section.

Rollin, May 18.

B. A. Caldwell, superintendent of the Siskiyou County D. Co. coal mine, at the Herr ranch, between Yreka and Ager, is manager of a company organized at Denver, Colo., last week with C. Tucker, J. S. Perky and L. L. Rees to develop coal and oil property. He has bonded a section and a half of land in Sbasta valley, near Snowden, for \$38,400, in which coal is thought to exist; also the J. E. Harmon section for \$51,200, and the J. E. Cooley section, says the Journal. This location is 7 miles north of Yreka, covering 3800 acres.

The J. S. Lowden mining claims have been bonded to C. Tucker, J. S. Perky, L. L. Rees and B. A. Caldwell for \$30,000, including all water rights and privileges. The claims comprise the King hydraulic mine, the Fine Gold, the Santa Cruz and Monterey mines at Hamburg Bar, Klamath river, near Yreka. The company has also located 10 miles of ground around and above Hamburg, and will build a 14-mile ditch from Scott river, to furnish water for hydraulicking.

O. H. Lawson & Co. will open up their group of mines on Humbug creek, near Hawkinsville, and begin development work by June 1.

TRINITY COUNTY.

Operations were resumed last week on the Yellowstone mine on the East Fork, near Trinity Center, under bond to W. Gill.

TULARE COUNTY.

In connection with other "scripper" cases the U. S. Supreme Court has also decided the cases of the Cosmos Exploration Co. vs. the Gray Eagle Oil Co. and the Pacific Land Co. vs. the Elwood Oil Co., both suits involving title to oil lands near Visalia, affirming the decision of the Circuit Court of Appeals. These cases involved the general question as to the validity of locations made on mineral lands in lieu of non-mineral lands surrendered within the limits of forest reservations. The Pacific Co. and the Cosmos Co. claimed under the locations of this character, and sought to oust oil companies claiming the lands under the placer mining laws.

TUOLUMNE COUNTY.

T. J. Curley has bought the Niagara and Silent Friend claims, south of the Tuolumne river, near Groveland.—The Harvard G. M. Co., near Jamestown, has bought the Sobrante quartz lode claim.

COLORADO.

BOULDER COUNTY.

The Rosalind tunnel on Hematite mountain, near Eldora, has resumed work, says Manager Hughes.

Manager Mitchell of the Sylvanite M. & M. Co. says they are driving a tunnel on the Free Milling group on El Dorado mountain, near Eldora.

The Golden Age group, near Wallstreet, has been sold to H. E. Simmons & Co. of New York and operations will resume next month. A cyanide mill of twenty

tons daily capacity will be built, with an electric power plant on the St. Vrain that will develop 500 H. P. Assays show \$10 in gold. The group was sold for \$250,000 and C. H. Tallmadge will be manager, with M. J. Swisher superintendent.

CHAFFEE COUNTY.

Two more companies are reported organized by Michigan and Illinois men to operate near Winfield. The Fortune mine will be started up next month by S. Hopkins and the Hale estate. Their vein carries galena, with silver values. On No. 2 level there are 2 feet of grey copper ore showing, average smelter returns from which gave \$42 per ton. The Middle Mountain Co. own the northeast extension of the vein for 1800 feet. Superintendent R. Taggart of the Tasmania C. M. & M. Co. says their crosscut tunnel on the Last Dollar mine is going ahead and 30 feet will cut the ore shoot. The Fairplay M. & T. Co. started up work this week. The Belmont and Edna May also have resumed. A. E. Stahler is general manager of the Belmont, Middle Mountain, Edna May, Banker and Fairplay.

CLEAR CREEK COUNTY.

(Special Correspondence)—Since the organization of the Trans-Continental Transportation & Mining Co. last week, with W. A. Cooper as president, R. C. Viñler manager, and J. F. Brandes of Denver consulting engineer, interest in Clear Creek county, especially around Georgetown, is increasing. The object of this company is to build a tunnel through Argentine Pass to permit of the railroad establishing a line through same, thereby connecting with the Colorado & Southern at Georgetown on the east side and Keystone on the west side of the divide, and at the same time shortening the route from Denver to Leadville several hours. In driving this tunnel they will cut the Argentine mineral district. German and English capital is interested. Denver, May 15.

At the Allunde group, near Georgetown, sinking will resume from the 1000-foot level, at the edge of the Haggart ground. The bottom of the level shows the ore body to continue downward. The company is still driving the 600, 750 and 1000-foot levels ahead. Haggart Brothers made a shipment of ore last week from their lease on the 1000-foot level, being thirty-seven tons of silver ore which netted \$6227.27. There have been a number of applications for leases on the adjoining ground, 50% royalty being offered, but the company have decided to work the ground themselves.

J. H. Towne, of Pendleton, Ind., vice-president of the Indiana G. & S. M. Co., has started work on the company's mines on McClellan mountain, near Georgetown.

Another shipment of lead concentrates was made from the Mendota mill, near Silver Plume, last week. The product is taken from the old stopes and dirt that would otherwise go into the dump and be a loss.

A mill for handling their concentrating ores is proposed by the Waldorf Co., near Silver Plume, says the Silver Standard.

Superintendent Towne has men at work on the mines of the Indiana G. & S. M. & M. Co., and operations on the tunnel have resumed.

CUSTER COUNTY.

J. P. H. Callahan and R. E. Myers of Westcliffe are operating a bond and lease on the King of the Carbonates group, near Westcliffe, the lease being for two years and the bond for \$50,000. Most of the development work is on the King claim.

DOLORES COUNTY.

Miller, Lee & Reld, who have a lease on the Vestal dump, one of the United Rico M. Co.'s group, near Rico, are getting their mill ready for operating during the summer. They intend to add another table and otherwise increase the capacity.

FREMONT COUNTY.

The Fidelity Oil Co., operating near Florence, report putting another string of tools in operation.

GILPIN COUNTY.

Additional machinery is being put in at the Benton mine on War Eagle hill, near Rollinsville, operated by the Northwestern Colorado Exploration Co., the hoist having a capacity of raising one ton from a depth of 500 feet.

Work on the 45-stamp slow-drip mill for the Gregory-Buell Con. G. M. & M. Co., near Central City, is progressing. The mill building is a part of the top buildings of the main shaft of the Buell, and the ores when hoisted will be delivered direct to the stamps with but little extra handling. Air drills are working in the 700-foot level running off from the Buell shaft.

The holdings of the Boston & Denver

Con. M. & M. Co., near Central City, were sold at sheriff's sale last week. The holdings, consisting of fifty lode claims, mill sites, the 80-stamp mill, land and real estate, machinery and other improvements, were offered in two parcels, being bid in for a total of \$271,000, by E. W. Hurlbut of Denver, representing the Western creditors, and D. Porter and T. King of Massachusetts, representing the Eastern creditors. E. W. Hurlbut says as soon as the details are completed the properties are to be worked extensively. This will include sinking the Cook shaft an additional depth of 300 feet, which would put it down to the deepest workings of the Flak or Bobtail, a total depth of 1200 feet, and the Cook shaft would be used as the main working shaft of the group.

The Delmonico G. M. Co., operating the Delmonico group on Quartz hill, near Central City, are setting up machinery for the amalgamation and concentration plant and expect to have it in operation by June 1st.

JEFFERSON COUNTY.

Manager Carpenter, of the Carpenter smelter at Golden, says operations will resume June 1.

LAKE COUNTY.

A strike is reported in the Tiger mine, near the head of Iowa gulch, 2 miles from Mosquito range, and 1 mile east of the Reno mine, near Leadville. Ames, McCullom & Son and J. Carter, owning the Tiger, are working through a tunnel 150 feet long, and at depth of 80 feet below the surface, have cut a vein carrying \$60 per ton in gold, twenty ounces silver and a percentage of lead.

The shaft of the Louisville mine on Iron hill, near Leadville, is to be sunk several hundred feet deeper, work beginning next week. At present work is being carried on between the 600 and 700-foot levels in a body of zinc ore. The copper sulphide shoot they expect to strike by sinking has been opened up in the Minnie Lee mine, adjoining the Louisville, by the Yak tunnel.

It is reported the Greenback mines, on Carbonate hill at Leadville, will be consolidated with the Rialto group, and operations resumed.

Manager T. S. Schlessinger of the Bon Air mine, near Leadville, reports opening up a body of lead carbonate ore on the lower 540-foot level. Two carloads have been shipped, showing 200 ounces silver and 15% lead.

MINERAL COUNTY.

Superintendent W. G. Boyle of the Golden Crown Co. says operations have resumed on their group north of the United Mines Co., near Creede, and a new shaft will be sunk.

PARK COUNTY.

The placer season opened last week at Alma and Fairplay. The deal for the Alma placers by the Snowstorm Hydraulic Co. has been closed and J. Fortune is superintendent at Alma and D. E. Rowe at the Snowstorm. Improvements in the way of ditches, reservoirs, etc., are proposed to prepare for a heavy season's gold washing next year, in addition to using all of the water supply available for taking out gold this season.

SAN JUAN COUNTY.

Manager Condit at Silverton says he expects to build this season an electric power plant at Eureka, a concentrating mill at the mouth of the Picaque, and complete the two tunnels now under way—one to cut the Toltec vein and the other at the head of the south fork of Eureka gulch to cut the Grand Mogul vein. Also he says the Astor M. Co. has been organized to take over the Sioux M. Co.'s property and the Astor group of five mines. He has awarded contracts for extending the Toltec tunnel 600 feet and the Mogul tunnel 200 feet, and expects to be stripping ore by August 1.

It is reported that work has resumed on the Marcella tunnel, with J. Woods superintendent. This mine is near the railroad crossing of the Animas river, 1 mile south of Silverton, and the tunnel is 600 feet in Kendall mountain.

SUMMIT COUNTY.

The Mountain Pride M. Co., near Breckenridge, will put on more men and increase development. The mill will be started up next week, says Manager Schwartz.

TELLER COUNTY.

The Mary McKinney G. M. Co. of Cripple Creek will put in a washing machine which will have a capacity of 300 tons of rock per day, and instead of the company shipping three grades of ore they will make one grade.

The cyanide plant of the Globe M. & R. Co. began operations last week on ores from the Ironclad mine on Ironclad hill.

There are four steel tanks, each holding 110 tons of ore. It is figured a tank a day will be used, as the rock from the Ironclad is porous and needs but little leaching. The ore averages \$6 per ton.

The Van Fleet sampler, near Cripple Creek, which has been transformed into a cyanide mill, was turned over by the contractors last week to the Globe R. & M. Co. The plant has a capacity of 100 tons a day and it is the intention of Manager Ross to begin on 50 tons a day from the company's mines and the rest will be custom ore. In addition to other leases the Globe Co. has a long time lease on the Ironclad mine on Ironclad hill. The company is taking out ore, of which there is a large tonnage blocked out in the stopes and drifts. Shipments to the mill have begun.

J. M. Downing, of Denver, president of the Old Gold M. Co., Cripple Creek, says that last week lessees M. C. Greve and C. E. Brady, working in the lower levels, opened up a body of ore while sinking the shaft at the 265-foot point, from which samples gave returns of 3 ounces gold per ton. There are several streaks in the vein, one of which is 8 inches wide, assaying 5 ounces.

The Cripple Creek Cyanide Co. has incorporated; F. A. and F. Wright, C. H. Clark, N. C. Tallafiero and W. G. Briery, with principal office at Gillett. The object of the company is to acquire, lease, hold and operate lodes of gold, silver, copper, etc., also to build and operate mills.

The Aztec G. M. Co., owning a group on Mineral hill, near Cripple Creek, will spend \$20,000 this summer in the development, says Superintendent F. Conner. The Aztec Co. owns the Illk, King Solomon and May Queen, on the northeast slope of Mineral hill. One shift is sinking on the Illk claim and it is the intention of the company to go to depth of 700 feet.

Plans are being drawn for a \$25,000 shaft house and ore bins to be erected on the Blue Flag claims on Raven hill, Cripple Creek, says the Gazette. The property is owned by Denver parties.

An ore shoot is reported opened in the bottom level of the Anaconda mine, Cripple Creek, by H. P. Dahl, operating that portion of the company's ground under lease. The strike was made above the fourth level of the winze. The rock carries sylvanite. The Anaconda vein was barren of shipping values in the second and third levels of the winze. In the third level sulphide began to appear. Dahl's lease permits of his sinking the winze an additional 100 feet, but until the drainage tunnel cuts the water course he can not do anything; as soon as the water is drained out he will resume sinking. There is a total of thirty sets of lessees operating on the company's ground, of which number twelve are shipping ore.

IDAHO.

BANNOCK COUNTY.

The Lost Horse group, near Pocatello, owned by the Intermountain G. & C. Co., is to be equipped with a steam hoist and pump. The mine is shut down temporarily on account of water becoming troublesome. As soon as the machinery is put in the company will begin taking out ore, which will be shipped to the smelter at Mackay.

IDAHO COUNTY.

J. E. Jewell, manager of the Gold Reef Co., Thunder Mountain district, says the Dewey mine, near Roosevelt, has ten stamps dropping.

OWYHEE COUNTY.

Manager W. C. Orem and Superintendent F. C. Clark of Salt Lake, Utah, have started work on the Palmer-Holland group of mines on Florida mountain, near Silver City, owned by the Trade Dollar Extension M. Co. of Salt Lake. A tunnel will be run to cut the Holland mine 100 feet deeper than the point where ore was taken out by leasers last fall. It is then proposed to open the group by a tunnel from a point near Jordan creek, below Black Rock gulch.

SHOSHONE COUNTY.

The decision of the Federal Court against plaintiff in the case of action by P. Clark et al. vs. Buffalo Hump M. Co. and the Empire State-Idaho M. & D. Co. to procure a cancellation of the deed conveying a four-fifths interest in the Ella and Missing Link lode mining claims, near Burke, and to compel a reconveyance thereof, has been affirmed by the Circuit Court of Appeals.

Manager J. E. Steen of the Granite & Ollie Con. G. M. Co. says a cyanide plant will be built, work beginning on it next month. The shaft has been unwatered and ore is being taken out. The group of mines owned by the company are on Granite creek, 5 miles east of Murray. They have a 10-stamp mill operated by water power.

MONTANA.

CASCADE COUNTY.

A strike is reported on the farm of J. Gibson, 5 miles south of Belt, and a Helena company has been given options on the ground. Assays show an average of \$6 a ton in ore, which can be treated by cyanide.

CHOTEAU COUNTY.

The Josephine C. M. & S. Co. has been incorporated under Arizona laws by P. Stark, J. Brown and H. A. Powell of Altyn, Mont. The properties of the company are on Swift Current river, on the Blackfoot ceded strip, near Choteau.

FERGUS COUNTY.

Superintendent R. W. Jones says operations will resume at the Mammoth mines and mill near Lewiston.

F. A. Earls et al. of Salt Lake City, Utah, have bonded the Ansonia and Stand Pat claims, north of the Barnes-King group, in North Moccasin district, near Kendall.

MADISON COUNTY.

The Treasure State M. Co. has been organized to develop the Eleanor and an adjoining claim, near Rochester, also a group of claims near York (Lewels and Clarke county). It is said the company intends to build a mill and cyanide plant at York. Their ore carries values in gold and silver.

PARK COUNTY.

It is stated the Montana Coal & Coke Co. of Horr and Aldridge is making arrangements to open up a new vein of coal, and that the coke output will be increased in consequence, the demand for coke being in excess of the supply.

NEVADA.

CHURCHILL COUNTY.

W. McCann et al. of Wadsworth, Washoe county, have bonded the Sifford claim in I X L district, 90 miles northeast of Wadsworth.

HUMBOLDT COUNTY.

The Nevada Sulphur Co. is shipping regularly twenty-five carloads a week of crude product from Humboldt House. The Nelson copper mine at Jackson creek has been bonded to Eastern parties for \$40,000, says the Lovelock Tribune.

LINCOLN COUNTY.

At the Quartette mine, at Searchlight, development progresses. Next week sinking will resume from the 600-foot level. This level is reported showing a 20 foot vein averaging \$20 per ton. In the mill thirty stamps are dropping, crushing ninety tons of ore daily. F. Siegel has a contract from the Quartette Co. on the Sazerac group of mines.

NYE COUNTY.

The Reno Ray M. Co. of Tonopah has been incorporated at Reno, under Arizona laws; F. D. King, G. F. Halla, J. J. Rafferty, F. G. Kaufman and F. L. White, to operate a group in the Ray district, near Tonopah, and near the Ray & O'Brien mine. Sinking will begin by June 1st.

The Lone Mountain M. & D. Co. has been incorporated under the Arizona laws to operate the Cornella, Rarus, Crown Point, Jack and Iron Quartz claims, adjoining the Eutopia group, owned by Cutting & Griffin, in Lone Mountain district, near Tonopah. J. W. Douglass, W. B. Pittman, V. Perrino, J. Coleman and C. D. Van Duzer are directors. Development work will begin next week.

J. C. Gladden, F. H. Lathrap et al. of Salt Lake City, Utah, have incorporated the Tonopah-Alpine M. Co. to operate a group of seven claims and four fractions adjoining the Nevada-Alpine group at Tonopah.

WASHOE COUNTY.

A one third interest in the Forlorn Hope at Olinghouse canyon, near Wadsworth, has been sold to W. T. Golding for \$5500.

At Olinghouse Camp, near Wadsworth, the Springfield-Nevada M. Co. of Springfield, Mass., has taken over the entire interests of H. T. Benson & Co., merging the Slip, Renegade, Smuggler 1 and 2, and Slip mill on the Golden Fleece placer; latter included the W. M. & M. Co. mill and placer ground; also Cabin No. 2, Midway; Canada, V, and Clipper placer claim, \$20,000 being paid for one-half interest in last named claims. Both mills are to be kept on continuous run of ore from Cabin No. 2 and Slip and Renegade mines. I. Miller of Westfall, Mass., is president and manager, and H. T. Benson is superintendent.

WHITE PINE COUNTY.

The Ne Plus Ultra mine at Hamilton is shipping ore.

McCornick & Co. of Salt Lake are reported to have bought the Grand Deposit, Defiance and Kansas groups on Muncie

creek for New York men for \$100,000. In the three groups are thirty-four locations, 70 miles west of Oasis, and on which 2000 feet of work has been done. Ore showing an average of 6% copper, \$2 gold and eight ounces silver has been opened up.

NEW MEXICO.

COLFAX COUNTY.

The Confidence mine at Elizabethtown has closed down temporarily pending the arrival of additional machinery which will be used for further development work. The main shaft is down 400 feet, at which point the vein has been cut. The company will move its mill to the mine.

GRANT COUNTY.

The E. G. Maroney interest in the Tarantula mine, in the Burros mountains, near Lordsburg, has been sold to C. Morrill, who, with W. B. Wayland, the other owner, has begun sinking in the shaft.

GUADALUPE COUNTY.

Development work in the oil field around Santa Rosa has ceased, except by the O. K. Crude Oil Co. This company is down 850 feet and is reported making slow progress in drilling, as it experiences considerable trouble in getting the machinery out of the well and replacing worn out or lost parts. Work has been suspended on the Newman and the machinery will be used in drilling another well by another company, 1 mile distant from the Newman well. Other companies are holding off to let the O. K. Co. explore the field, says the New Mexican.

SIERRA COUNTY.

C. M. Root & Co. are working the Happy Jack mine and the company has leased the Philadelphia M. & M. Co.'s mill at Andrews for treating the ore. E. J. Fender is mill superintendent.

TAOS COUNTY.

The Glen-Woody M. & M. Co., near Taos, W. M. Woody, manager, has forty men at work and are building a mill and cyanide plant.

OREGON.

BAKER COUNTY.

Superintendent J. J. Hennessy says operations will resume on the Goldhug-Grizzly group, near Sumpter. There is a shaft down 100 feet and midway between two parallel veins. It will be sunk 200 feet deeper, at which point it is estimated one of the ledges will be cut. A crosscut will be driven to the other. The Goldhug-Grizzly consists of ten claims, near the hex, owned by Minneapolis, Minn., men. The mine is equipped with a steam sinking plant, capable of going down 1000 feet.

Superintendent F. T. Kelly of the I X L and Hidden Treasure mines in the Greenhorn mountains, near Sumpter, says operations have resumed. A 5-stamp mill, to be run by steam, will be built, construction beginning next week. It is intended also to put in a sawmill this summer. On the I X L there is a 200-foot shaft and 400 feet of drifts; on the Hidden Treasure the shaft is down 110 feet, with 200 feet of drifts. Average assays of the ore show \$10. When operations were suspended in February, a cross vein connecting the parallel veins in the two mines was being opened up.

Superintendent Neel of the Oregon S. & R. Co., at Sumpter, says the blower, the Corliss engine, all the shafting, the hoilers and piping are all in place and the furnace is nearly finished. It is expected to have the plant in operation by May 20. In the briquetting department connections have been made for the conveyors to and from the compressor. The roads about the plant are being macadamized to facilitate hauling.

The Troy, N. Y., owners of the Carpenter Hill group, Pocahontas district, near Baker, are putting up a 5-stamp mill. This company has been doing development work on the Carpenter Hill and three veins have been opened up. One vein shows a 2-foot shoot. The mill will be amalgamating and concentrating, and the frame of the building will be made large enough for the addition of other stamps later on.

Work at the Blue Bird mine near Sumpter is being concentrated largely on the drift on No. 3 vein, says Superintendent Thorpe. He is driving another crosscut from this drift to determine the width of the ore body again. These crosscuts are made at intervals of 75 feet, the last one showing the quartz 13 feet wide. He has concluded to delay the erection of the compressor plant until the mill that is to be a portion of the developing plant has been built. It was thought better to have both go up at the same time, as, if the drills were put into the drifts where the ore body is found, a large amount would be removed, even from the headings,

which would have to go over the dump, there being no room for storage bins.

W. E. Saunders, J. Rosenthal, J. H. MacCallum and R. L. Neill have incorporated for the development and operation of the Pulaski group of mines, near Sumpter.

Manager W. Cable has men at work on the Adalene group of the Oregon G. M. Co. on Rock creek, near Sumpter. A tunnel is being driven into Elkhorn mountain.

Manager Butze began work last week at the Little Cracker mine, near Sumpter, and has started a crosscut tunnel which is expected to cut the vein at a depth of 125 feet.

Development work began last week on the Gold Reserve, between the Bonanza mine and the Gladstone, near Sumpter, under Manager W. H. Meade. The Gold Reserve Co. is made up of Spokane, Wash., men, F. W. Hilcher president.

Manager J. B. Higgins of the Constellation mine, near Sumpter, says work will begin June 1.

The foot wall in the Midway crosscut, near Sumpter, was reached last week, says Manager Hendryx, showing a vein 80 feet wide. The crosscut was carried ahead till the country rock had been entered 20 feet in firm, non-mineralized slate. The shaft will be sunk on the foot wall side, as the vein dips at a high angle and the country rock there insures a safe, economic working shaft.

GRANT COUNTY.

The Standard Con. G. M. Co., near Quartzburg, report development work progressing. The drift on the Standard vein is opening up ore showing values in gold, cobalt and copper. Work is also being done on the Cleveland-Wille Boy crosscut, and it is expected the vein will be reached on this level next week, giving a depth of 350 feet. It is intended to build in the early fall a reduction plant.

The Hoosier Boy Co., operating in Prairie district, has been reorganized, says L. G. Wheeler of Baker City, the name of the new company that will handle the Prairie Diggings mine and mill being the Juniper G. M. Co. The Hoosier Boy Co. will continue to operate its northern Idaho mining properties, while the Juniper will work the Prairie Diggings group. J. W. Messner is manager.

Manager J. P. McGuigan of the Alamo mine at Alamo says he is putting in the foundations for their water power plant and stamp mill.

JACKSON COUNTY.

A 5-stamp mill and other machinery have been installed at the Bowden quartz mine, near Gold Hill, by the Bowden G. M. Co. of Los Angeles, Cal. They have run a number of tunnels and shafts and exposed a workable ore body.

JOSEPHINE COUNTY.

The smelter at the Sowell copper mine, near Waldo, will be blown in next week. These mines are owned by the Mountain View Copper Co. The ledges have been opened to depth and carry values in gold with the copper. The question of transportation is expected to be settled this summer by building in of the Oregon & Pacific Railroad, which line will pass through the center of Waldo district. The Waldo S. & M. Co. are preparing to open up their mines next month.

MALHEUR COUNTY.

Manager J. F. Melke of the Black Eagle mine, Malheur, says he expects to start up their 20-stamp mill again next week.

SOUTH DAKOTA.

CUSTER COUNTY.

F. C. Crocker, at the J. R. mine, near Custer, is putting in an air compressor and air drills. The shaft is down 200 feet, at which point the ledge was cut and later explored by a drift of 500 feet, showing values in gold.

The White Cloud M. Co. has men at work on its claims near Custer and a shaft is being sunk. The vein is free-milling quartz, assaying \$14 in gold. There are nine claims in the group on Laughing Water creek, with a water right carrying sufficient water for milling purposes and millsite. The group adjoins the Gold Flash.

TENNESSEE.

J. P. Channing of New York, manager of the Tennessee Copper Co., operating at Copper Hill, says in twenty-eight days two furnaces on the properties of the Tennessee C. Co. reduced 30,095 tons of ore, an average of 537 tons daily to the furnace. This did not, of course, include the coke employed in the charge. The total cost of reducing the ore last year was \$1.05 per ton, while returns thus far the present year shows further reductions in the cost of treatment. The tonnage per employee smelted was twenty tons a day.

UTAH.

BEAVER COUNTY.

The Royal G. & C. Co. was incorporated at Denver, Colo., last week by A. B. Lewis, C. C. Parsons, H. W. Robinson, W. L. Jameson, C. J. Caughey, F. Knox, J. Henshaw and E. F. Freudenthal. A. B. Lewis of Salt Lake City is president. The main office of the company will be at Salt Lake. The company controls a consolidation of 200 claims, including the Montreal, Atlas, Beacon, Mammoth and Highland Boy groups near Milford, also the Adams & Muldoon groups in Washington county. These groups include gold, silver, lead and copper properties. President Lewis says it is the intention to begin work at once on the Montreal, Rebel, Atlas, Nellie, Monitor and Highland Boy groups, and by fall 200 men will be at work. Next year a 1000-ton smelter will be put up near Milford.

Twenty-five miners went on a strike last week at the Old Hickory mine of the Majestic Co., near Milford, because the management refused to accede to the demand that the machine men and chuckers in the shaft be given \$3.25 per day, and in the tunnel \$3. The machine men had been receiving \$3.25, but the management insisted that the chuckers were merely helpers and should receive \$2.75, the same as the miners. The miners claim the chuckers and machine men change off and that as much skill and experience are required from one as the other. It is said there has been some talk of organizing a union. Although only four men were affected by the disputed point, all the miners quit, were paid off, and the mine closed down. Machinery repairs are being made.

President A. B. Lewis of the Royal G. & C. Co. has added a total of thirty-five claims to the company's holdings, including the Marengo group, in Star district, and the Culcossal and Gogehic groups in Beaver Lake district, near Milford. He says gasoline hoists and complete equipment for the development of the Montreal and Atlas-Monitor groups will be put in.

The Newhouse M. & S. Co. has incorporated at New York. It is understood, to acquire from S. Newhouse his mining interests in Beaver county, including the Cactus copper mines; L. Kramer, T. L. Hermann, J. Josten, W. C. Taylor and A. B. Ditter are directors.

GRAND COUNTY.

Manager Duto of Memphis, Tenn., has started work on the Grand View tunnel, near Basln, in the La Sal mountains. They will run 400 feet to crosscut the Lincoln vein.

IRON COUNTY.

A strike is reported made in the Johnny mine at Stateline. The find was made in the old cage shaft while sinking. It is proposed to add twenty more stamps to the mill, says Manager W. J. Dooly.

JUAB COUNTY.

Superintendent W. D. Sheppard says he is arranging to put up a 20-stamp mill at the Pioneer mine, near Diamond.

Superintendent C. E. Allen last week resumed sinking in the main shaft of the Centennial-Eureka mine at Eureka. Operations ceased last month on account of an inflow of surface water. The shaft is down 20 feet below the 1400-foot level, or 1600 feet from the surface. It is intended to send it down 500 feet farther, at which point a station will be cut and a drift started to tap the ore bodies at that level.

The Lilly M. Co., operating in East Tintic district, near Eureka, will be reopened by June 1 and further development work done. The mine is equipped with hoisting apparatus, ore bins and blacksmith shop and the shaft is down 200 feet. The ore is galena.

The Dagmar-Northwest Co., near Eureka, have set up their compressor and the 15 H. P. engine will be replaced by a heavier one. The shaft, which is down 300 feet, will be sunk to the 500-foot level, when drifting will be started.

At Eureka, the Centennial-Eureka payroll for April amounted to \$15,000, the Eureka Hill \$3000 and Gemini \$6000. Other mines near Eureka paid out \$12,000 more, making a total of \$36,000, with about the same amount around Mammoth, Silver City and Diamond.

PINTO COUNTY.

The L. and N. group of fifteen claims in Ohio creek mining district, near Marysville, under bond and lease to J. F. Mount of Richfield for \$50,000, will be taken up and operations begun next week. The mines of Moon & Mathews on Deer creek are reported sold to Salt Lake parties. G. F. Dalton, manager of the Gold Vein M. Co., says work has resumed.

The Iron mine, east of Marysville, has men at work and will for the present ship acar a day. L. E. King is superintendent.

SALT LAKE COUNTY.

Manager Hatfield reports the drills run-

ning on tunnel and crosscut at the mines of the Albion M. Co., at Alta. The tunnel is in 940 feet, while the crosscut has been driven westward 135 feet.

The driving of the intermediate tunnel on the group of the Kennebec M. Co. at Alta resumed this week, through which the ledges of the Reed & Benson mine are to be reopened at greater depth. In the meantime the crosscut from the lower tunnel, in 4030 feet, is being driven ahead to a connection with the Flagstaff ledge, which is expected to be tapped within the next 100 feet at a point 1700 feet below the outcrop and 700 feet below the old stopes.

In the Dalton & Lark mine, at Bingham, the flood level has lately been receding at the rate of 5 inches a day, and the 850-foot is dry. Development work will begin on the 850 level next week. Owing to the rush of water the tunnel was last week advanced but 38 feet. A few days ago the tunnel went from quartzite through several feet of porphyry and is in quartzite again with an increased flow. Two cars of sulphide ore are shipped from the Brooklyn dally, while one goes from the Sampson, and an occasional carload of lead ore is sent out.

The mines of the Columbia M. Co., at Bingham, will be equipped with a concentrator, says Manager F. B. Cook. For three years, during which the company has been opening up its ore bodies, the management has been putting its low-grade copper-bearing rock through the Rogers mill, and deriving from it a product containing 30% copper with fractional values in gold and silver. The concentrator will treat 250 tons of rock daily. Milling ore has been opened up in the All's Well, What Cheer and other veins.

Superintendent Hall of the Copper Belt, near Bingham, reports they are shipping 250 tons of ore from the Commercial (Bingham Con.) dally, and that the Kempton shipments will soon be 100 tons a day, says the Bingham Bulletin.

The Ben Butler and Chicago & Bingham companies at Bingham have decided to drop the apex controversy and consolidate their interests as the Ben Butler-Liberal M. Co. Manager Jacobs of the Ben Butler will be manager for the consolidation.

The Sampson mines have been sold by the Western Exploration Co. to the Bingham Con. at Bingham.

SUMMIT COUNTY.

The Alaska, near Park City, has been shut down and the pumps pulled.

It is reported the La Reine mine, adjoining the Uncle Sam, near Park City, will resume.

Driving in the tunnel of the Steamboat group of mines, at the head of Snake creek, near Park City, resumed this week, says Manager W. V. Rice. The tunnel, which has been extended for 1600 feet, will connect with the main ledge in the next 300 feet, according to measurements.

The Ontario Con. G. M. Co. will begin sinking a deep shaft on its claims west of the Scottish Chief and Western Monitor at the head of White Pine canyon, near Park City. The group consists of twelve claims and is principally owned by Park City men, with J. E. Lucey as president and manager.

Fire of unknown origin destroyed the Park City zinc plant at Park City on the 14th inst., and also the office building; loss estimated at \$100,000, well covered by insurance. The plant had a daily capacity of 100 tons; A. L. Dickerman is manager of the company.

Superintendent Rood of the Ontario Silver M. Co., in his annual report for the year 1902 shows receipts from all sources was \$356,967.65. "Of the 25,922 net tons mined and sold, 24,678 tons came from the 1500-foot level and above, since no stoping was done below it. On December 31 all ore extraction was suspended. The ore remaining above the 1500-foot level was not yielding a profit sufficient to justify extraction under existing market conditions. Below that level so much of the ore has appeared to be of a concentrating grade that it was not expedient to begin extraction until it can be separated and treated according to its character. Notwithstanding the increase in certain classes of expense, due to deeper mining and to ore reserves diminishing above the 1500-foot level, the gross expenditures for the year were less than for 1901, except in the item of deadwork. The receipts, however, were lessened by difference in grade of ore, smaller tonnage and by fall in price of silver. In 1901 average sale price for silver was 58.17 cents per ounce, in 1902, 52.73 cents per ounce. The comparative loss on the value of silver alone amounts to \$60,000. These results indicate the necessity of new methods and lower treatment cost. The nature of the treatment to be adopted for the low-grade ore will be governed by the results of experiments in progress."

The mill at the Comstock mine in

Thayne's canyon, near Park City, is in operation, says Manager Dusseidorf.

WASHINGTON.

FERRY COUNTY.

Manager W. M. Ridpath of the Lucille Dreyfus mine, near Republic, says it is proposed to drive a tunnel from above the track of the Washington & Great Northern Railway. There is on the dump of the tunnel level upon which the hoisting machinery is in operation 150 tons of ore, the value of which runs \$90 per ton. The ore is of smelting character. The winze is down 135 feet below the tunnel level.—The Mineral Hill mine at Danville is still idle.—In the Faithful-Surprise connection has been made between the Surprise shaft and the tunnel. Some surface work is being done toward starting a new tunnel.

KLICKITAT COUNTY.

Drilling for oil by the Columbia River Dev. Co. was resumed last week at a point a mile west of Castle Rock, Or., on the opposite side of Columbia river, where the drills are down 200 feet. Considerable interest is reported being taken throughout Oregon and Washington over the oil prospects along the Columbia. Secretary F. Graham says the company has secured 20,000 acres by location under placer mining laws and by lease.

OKANOGAN COUNTY.

On Palmer mountain, near Loomis, a strike of free gold ore is reported on the Security mine of the Security G. M. Co., showing 2 feet in width, with values in gold, silver and galena.

Superintendent C. Peterson has men at work driving the tunnel at the Favorite mine, near Loomis.

Superintendent J. M. Hagerty, at the Ruby mine, on the east slope of Mount Chapaca, near Loomis, says three eight-hour shifts are driving in the lower tunnel, making 6 feet per day.

SNOHOMISH COUNTY.

A. S. Chase, of Gold Basin, manager of the Sunrise M. Co., says operations will resume next week. A tram, three-quarters of a mile long, will be built between the mine and the company's road on the south side of the range. This road was built last summer and connects with the "45" road to Wallace, Idaho, on the Great Northern, which will be the shipping point for the Sunrise.

STEVENS COUNTY.

B. F. Parker, manager of the Alice G. M. Co. of Blue Creek, says the stockholders in Portland, Astoria and Spokane have decided to put in a concentrator, which will be of fifty tons daily capacity. It is expected to have it in operation by August 1. The mines are $4\frac{1}{2}$ miles northwest of Chewelah, $1\frac{1}{2}$ miles from Blue Creek siding. Considerable development has been done, but for two years the property has been idle. The ore bodies show a ledge 27 feet wide, assaying \$6 in gold and a percentage of copper. The ore also carries a little silver, but no lead. Some machinery that is on the Stella, owned by the same company, will be transferred to the Alice and men will be put to work in the lower workings and stopping begun.

Superintendent B. J. Gleason of the Old Dominion mine, near Colville, says that F. Peck of Chicago, Ill., and his associates, who own the group, will take an interest with the lessees of the mine and work will be increased. The 100-ton concentrator that has been idle at the mine for the past six years will be overhauled and put in operation. The flume, which furnishes the concentrator with water from a stream 2 miles away, has been repaired, and the air compressor at the lower tunnel is in operation. Since work was suspended several years ago the lower tunnel, which has a length of 3000 feet, has fallen in in places, and it is being cleared and retimbered.

The Silver Butte mine, operated by C. Knutson, expects to ship 600 tons of silver-lead ore during May. This property has been unproductive for some time owing to the shaft being filled with water, but during the winter a tunnel was started to tap the lower workings, which is expected to be finished by August 1.

The Last Chance mine (formerly the Silver Butte), on the east side of Deep creek, 8 miles from Northport, has resumed shipments, says C. C. Knutson, manager. Fifteen tons of ore a day will be shipped, until the 600 tons on the dump are delivered at the smelter. Stopping will also resume. The ore carries 18% lead, fourteen ounces silver and \$3 in gold per ton. Besides this ore there is a body of concentrating ore. A crosscut is being driven that is expected to tap the ledge at 380 feet on the 200-foot level.

WYOMING.

FREMONT COUNTY.

The Fremont County Oil, Gas & Coal Co. began operations last week on their

oil lands in Teton Basin district, near St. Anthony. Equipment capable of going to a depth of 1800 feet has been put up.

UINTA COUNTY.

The Idaho-Wyoming Oil Co. report increasing their holdings to 15,000 acres of land, most of which lies in Fossil Oil district, near Fossil. They are sinking two wells and will do additional development the coming season.

FOREIGN.

AFRICA.

CAPE COLONY.

The Cape Tin Mines, Ltd., report stream tin, as well as tin-bearing lodes, on their lands 16 miles from Cape Town. The Cape Government have no claim upon tin or tin ore, and no Government royalty is, therefore, payable. Manager Mills-Davies reports that the depth of the deposit of stream tin to vary from 1 to 15 feet, with average value of 30% tin. On Annex Langverwacht at least two lodes have been found carrying tin, viz., the Langverwacht and Clinton lodes.

AUSTRALIA.

NEW SOUTH WALES.

Recent experiments in treating cinnabar from the Great Australian Quicksilver Co. mine at Yuigbar, on the Clarence, carried out in a newly designed furnace, having proved satisfactory, the company decided to build a battery of similar furnaces at the mine. These are expected to be in operation by June 1. It is estimated the ore can be mined and reduced for £2 per ton, and the company expects to make a profit out of 2% ore. There are 400 tons of 4% ore in the dump, and bodies of 2% and 3% ores are opened in the mine.

The British Broken Hill Proprietary at Broken Hill report, in Blackwood shaft, 300-foot level, good mill ore is being broken in the south end of main west stopes, in stopes off No. 4 winze, and in stopes under No. 7 shaft, also in the north and south ends and center of the main west stopes, 400-foot level. In Howell shaft, 300-foot level, fair grade ore is being broken from the central stope and from north end of stopes on 400-foot level. On 500-foot level stoping started with two machines.

A discovery of copper has been made 3 miles from Molong.—At Glen Innes mining for molybdenite is receiving attention, and a number of new claims have been taken up.

Alluvial gold is being obtained at Kianga creek, near Moruya. There are forty men on the ground. At the field known as Rat's Head, in the same district, recently a miner found a nugget weighing 2½ ounces.

Pay rock is being raised from Seymour's Doughboy Hill mine, Bywong. A drive is in 80 feet at the 150-foot level.—The revival of mining along the White Reef, West Wyalong, is due to a shoot of ore showing in the Barrier mine, which has been driven 230 feet, giving an average width of 2 feet, and yielding two ounces per ton.

Activity in mining is increasing around Cowra. A number of prospectors are making wages, and claims are being opened up. All the available country has been taken up. The battery at the company's mine is not sufficient to treat all the ore from the field.

The Union Jack Co., Tumberumba, has taken up 100 acres in the bed of Tumberumba creek under the new Gold Dredging Act, and has thirty-four men dry-stripping who have a large tonnage of wash dirt ready waiting for water.

QUEENSLAND.

New Chillagoe R. & M. Co. returns from smelting works for March: Treated—Chillagoe ore, oxidized, 1543 tons; sulphide, 903 tons; Mungana ore, 872 tons; lead furnace matte, 94 tons; total, 3412 tons; producing 291.5 tons of matte, containing 152.6 tons of copper and 7888 ounces of silver.

The March returns for Charters Towers field are: Mills—19 906 tons of ore crushed for 21,500 ounces gold. Cyanide works—18,500 tons residues treated for 10,000 ounces bullion. For the quarter ending March 31st 57,313 tons milled gave 60,500 ounces, compared with 48,700 tons for 49,000 ounces for the same period of 1902.

VICTORIA.

At Creswick, the drives at the Berry Consols Extended have been fitted up ready for the installation of the electric haulage plant, which is expected next month.

In Mount Morgan field, the crushings for March were: Mt. Morgan mine, 19,515 tons yielding 11,259 ounces, of the value of £3 19s 6d per ounce; Mt. Usher mine, 310 tons for 240 ounces, value £3 13s per ounce.

WEST AUSTRALIA.

President C. A. Moreing of the great Fingall Con., Ltd., in his annual report to the directors at London, says during 1903 the main shaft was sunk 589 feet, making 758 feet total depth, and is now 100 feet deeper than the Armstrong shaft. The Armstrong shaft was a small shaft, sunk in the early days of the company, but with the increased size of the mine, and of the equipment, this shaft was not large enough to handle the ore. From the new shaft it will be feasible to work the mine to a depth of 2500 feet. During the year developments in south of No. 4 level and of No. 5 level have shown the main ore chute, instead of being more or less like an inverted fan, is quite regular in size, from the fourth level to the bottom. In the old levels (first, second and third) the ore body was short, and the ore in the south of these levels averages 6 dwts. only, so that this portion at the top of the chute is assumed to be unpayable, yet on development it may prove otherwise. A winze was sunk from No. 8 level down to the future No. 10 level, in which results were uniformly satisfactory. Outside the main pay chute another chute was found, which is of lower grade, averaging 14 dwts. in the level. It is 400 feet long and 7 feet wide. At the bottom of No. 2 water shaft 7 feet of ore was struck, running 18 dwts. a ton. No. 5 level is being driven south. During the year 90,950 tons were extracted, taken mainly from between the sixth and seventh levels. The reef is wide and cost of timbering high, so it was decided the more economical way to work the mine was to stope the ore continuously from the seventh level to the fifth level. This will evade the necessity of timber at the No. 6 level. Then, it is proposed to stope from No. 5 level, which is already timbered as far as payable ore extends. Also, it is proposed to stope the mine from the ninth level to the seventh level, and in future levels will be placed farther apart. The mill has been increased from thirty to sixty stamps, with the entire remodeling of the cyanide plant and corresponding increases in the concentrating works. The treatment has given an average of 92%. Of the tailings from the mill 38% are slimes, of which 45,000 tons have accumulated, which run 4 dwts. per ton in value. A slimes plant is in course of erection. It is proposed to increase the mill to eighty stamps. The working costs have been steadily reduced during the year, showing a reduction of 10s. per ton, reaching 26s., not including development work, but including all other expenditure.

The Mint receipts for the month of March were 115,824 ounces.

Experimental work with a magnetic separator at the Broken Hill Block 10 mine is stated to be showing profitable results.

The gold yield of West Australia for March was 194,723 ounces—an increase of 17,000 ounces over March, 1902.—An alluvial find is reported from Black Range, near Mount Magnet. The first day seventy ounces of gold were obtained, including a sixteen-ounce slug.—The Ivanhoe Gold Corporation report the middle lode cut by the borehole 118 feet west of Patterson's shaft, 865-foot level. For the first foot drilled, borings assay gave 10 dwts. gold per ton.

A discovery of alluvial gold has been made near the Lady Mary mine, 5 miles southeast of Norseman, in the claim of Hamdorf & Steadman, at depth of 80 feet. In a claim south of the original find Shepard & Co. also obtained pay.

At Kalgoorlie, the diamond drill at the Great Boulder, stationed at the 600-foot level in Jansen's shaft, at north end of group, cut the northerly extension of the Ivanhoe east lode at a point 280 feet north of latter's lease boundary, and at depth of 1335 feet from surface. At point cut it averages 25 dwts. over a width of 10 feet. The management of the Ivanhoe has, with the consent of the Boulder Co., decided to put in a series of drillholes westward from the bottom workings of the Great Boulder, to test the main Ivanhoe ore bodies at vertical depth of 1600 feet.

BRITISH COLUMBIA.

(Special Correspondence).—Manager W. Gray, of the Velvet-Rossland mine, Ltd., says from March 25th to April 29th they were unable to ship, owing to the state of the roads. Shipped from April 29th to May 12th, 110 tons. The ore bins are full due to the difficulty in getting teams. Recent work has opened up a good shoot of ore on the second level—the farthest southern development yet made in this mine. There remains 100 feet to drift before striking the ore shoot of the Portland, which mine is also under Gray's charge. On the second level of the Velvet they have drifted 90 feet in ore, the entire width of the drift. Assay value of the ore is \$20. The output will be increased by this new find, and in addition there

are 1000 tons of fines to ship that will net \$3.50 per ton.

Rossland, May 18.

F. Watson of Spokane, Wash., has a working bond on the Rambler, near Beaverdell, in the Boundary district. A tunnel will be run on the lead for 250 feet, which is expected to bring the heading under the 76-foot shaft at depth of 110 feet.

Diamond drilling on the 700-foot level of the Josie mine last week struck the Annie lode. The Annie vein has been opened up on the 300 and 500 levels west of the dyke. The diamond drill has been moved to the 900-foot level.

G. W. Hughes, of Sandon, manager of the Sunset mine, says he intends to build a concentrator the coming summer at the Trade Dollar mine, above Cody, which is connected by tunnel with the Sunset.

Preliminary work for building an aerial tram line from the Eva mine to Pool creek in Camborne has begun, and it is expected to be in operation by July 31st.

Manager W. Pool, of the Ophir-Lade Co., owning the Oyster-Criterion group on Pool creek, near Camborne, has bought the entire property formerly owned by A. and C. Markay, M. Beaton and W. Stout. These are on Pool and Mohawk creeks, and are divided into three groups, the Sir Wilfred, the Homestead and the Idaho, a total of eighteen claims. They will be operated by the Ophir-Lade Co., which will then have thirty-seven gold claims. The leads are quartz, some carrying free gold. Work on all the groups will begin next week. Power will be had for all purposes from the fall on Mohawk creek, and 500 inches have been bought on Pool creek for the Oyster-Criterion mill. Work on the mill is progressing.

T. McGuigan, manager of the American Boy, near Slocan City, has resumed.

The White Bear M. Co., of Toronto, operating near Rossland, propose to build a concentrator and increase the mining plant. The second level (850-foot level) has shown several bodies of ore which will pay for mining and smelting without concentration, which are being opened up. In addition to the smelting ores, the concentrating ores have been opened up on the 850-foot level. Several sites for the mill are under option. B. MacDonald, of Spokane, is consulting engineer.

At the Spitzee mine, near Rossland, the unwatering is progressing. A larger sinking pump will be placed in the mine.

Surveys have been made for the Kootenay mine's tramway from the workings to the Canadian Pacific railroad, near Trail. The tramway will begin at a point below the lower adit, from which the ore mined in all the levels can be delivered by gravity to the terminal ore bins. It will be automatic and run by gravity, sufficient fall being secured in the mile and a quarter between terminals. The tramway is designed to handle 300 tons of ore daily, and after its completion the output of the mine will be increased to this figure.

The White Bear Co. at Rossland will put in a 20-drill compressor and a 125 H. P. hoisting plant this summer. The Canadian Pacific railroad will build a spur to the mine. It is intended the hoisting plant will suffice for the requirements of the mine to the 1200-foot level, and that its winding capacity can be increased, when necessary.

W. L. Laury, manager of the Green Mountain-St. Louis Con. Co., near Rossland, says additional machinery will be put in at the mine, including another boiler and a hoist capable of going to the 1000-foot level. After these are in, sinking the main shaft will be resumed from the 450-foot level.

On upper Boulder creek, near Atlin, C. D. Newton & Co. propose beginning operations on their hydraulic ground, which, for the first part of the season will be confined to ground sluicing, preparatory to putting in a plant next fall. It is intended to build a reservoir for conserving the water supply.

Superintendent W. Y. Williams says the steam shovel is in operation on No. 1 level of the Knob Hill mine near Phoenix. The shovel is mounted on traction wheels, and its dipper capacity is three-fourths of a yard (one and one-half tons). The capacity of the shovel is 660 yards per day of ten hours. It is fitted with a vertical boiler; size of engines, 7 by 9, duplex. Work has been resumed on the Ruth-Esther gold-copper mine on Sophia mountain, Trail creek, near Rossland, and the company expects to cut the ledge within the next 30 feet. The claims are near the Portland and Velvet mines, and on the same ledge as the Velvet. The tunnel is in 190 feet, and it is expected to cut the ledge at a depth of 150 feet. The vein on the surface shows values in gold and copper.

Arrangements have been made to put in a 30-drill compressor plant for the Nickel Plate mine at Hedley City, Similkameen district.

The Vancouver News-Advertiser says

Sing Lee, a wealthy Chinaman at Clayoquot, has bought the Wreck Bay placers, which about a year ago were deserted by a Seattle man, who had had a number of men at work. Sing has put on thirty Chinamen, developing the claims. They have been too largely worked out to be sufficiently profitable from the white man's standpoint, but may serve for Chinese.

The Lytton M. & Manufacturing Co. has been incorporated to develop the deposits of red and brown ochres on a plateau a few feet above Fraser river, near Lytton. Assays show some gold, and 30% iron oxide. It is intended to mine these deposits for paint manufacture.

The London office has sent orders for reopening of work in Camp Mansfield, at head of south fork of Kaslo creek, near Kaslo, in the Slocan district, after being idle for a year. The Kaslo-Slocan M. Co. are the principal owners. The ores are free milling gold.

J. C. Ryan, of Spokane, Wash., manager of the Soho group of claims in McGulgan basin, says his company has let a contract for driving a crosscut to strike the No. 4 vein on the Soho. As soon as there is sufficient water it is the intention of the Rambler-Cariboo Co. to start its mill. The Antoine is showing in the lower workings 4 feet of high-grade ore.

The Payne Co., at Sandon, is putting up a zinc separator.

C. V. Jenkins, office manager of the War Eagle and Center Star Cos., at Rossland, says on the Center Star and War Eagle 300 men are at work; the Le Roi has 375; Le Roi No. 2, 50, and 50 on the Columbia-Kootenay; the Spitzee has started with a few men, and the Giant is continuing development, and all told there are 900 miners in the camp. The standard scale is \$2.50 for muckers and \$3.50 for miners, per eight hour shift. On the War Eagle and Center Star, however, they are working a contract system, developed by Superintendent C. R. Davis. There men are paid for stopping on the basis of the lineal foot bored. The company furnishes all the material and does the hauling, including the loading of the holes, so that the miners get in a full eight-hour shift. The price for drilling may average from 28 to 30 cents per foot. The rate is fixed by the company. The miners are making from \$4 to \$4.50 per shift. The company furnishes the muckers. The plan seems to give satisfaction to both sides. Le Roi is doing a good deal of development on the contract basis. The War Eagle is shipping 250 tons a day and Center Star 350. E. B. Kirby, general manager of the War Eagle-Center Star Cos., has been experimenting on a wet process which he claims will be successful in milling and concentrating their ore, and the milling plant will be put in this summer.

The Spokane, Wash., owners of the Bluebird mine, in Slocan mining district, near Slocan City, will resume work next month and propose to ship ore. They will sink on the lead an additional 100 feet. From the bottom of this shaft they will drift in both directions.

A rich strike is reported made last week at the Athabasca-Venus mine on Morning mountain, near Nelson. While a tunnel was being driven on the lead a new vein was cut 300 feet in, showing values in gold.

The Morrison mine, near the Mother lode, at Greenwood, resumed operations last week. The Morrison Co. also owns the Atheist mine in Wellington camp. The B. C. mine in Summit camp has thirty-seven men at work. The Oro Denoro has six men stripping the ledge. At the Emma eleven men are at work and the mine is shipping to Trail Junction.

Manager Lane of the Wakefield mine, near Slocan City, is at the mine superintending opening of work after the winter's suspension. The Rambler concentrator has started up and the number of men at the mine increased. The Ruth is expected to put on more men at the mine, and the mill to start up. The Ivanhoe concentrator is running again, says Manager Hickey.

CANADA.

ALBERTA.

A bond has been taken on a group of coal measures 45 miles east of Fernie (B. C.), in the Crow's Nest, near Balmore, by the Granby Smelter Co. of Grand Forks, B. C., and the International Coal & Coke Co. organized under Washington laws, it having been ascertained that coal was of quality for coking purposes. The coal claims have a length of 7 miles, with nine seams, four of which have been prospected, giving an aggregate width of 60 feet of coking coal. Men have been put to work developing in three seams, and arrangements are being made for building coking ovens. The officers of the International Co. are: A. C. Flumerfelt and H. N. Gaier of Grand Forks, B. C., and W. G. Graves of Spokane, Wash.

NOVA SCOTIA.

Owners of coal mines in Nova Scotia profited through the coal strike in the United States last year, says the Boston Financial News. According to the annual report, the coal output in 1902 was 4,362,869 tons, as compared with 3,625,365 tons the previous year. The increase in the production of coke was even more marked, the season's output being 406,000 tons, as compared with 120,000 tons in 1901. Of iron ore 489,000 tons were produced and 28,279 ounces of gold.

MEXICO.

CHIHUAHUA.

The Detbridge-Burr Exploration Co. report a strike of 500-ounce silver ore in the Vencedora mine, near Parral.

W. Adams, manager of Las Minillas mines, 12 miles north of Chihuahua, has started two more shafts, one of which is on the Leona claim, above the former workings. This shaft will be put down on the supposed footwall of the east and west vein, and connect with old workings. Then drifts will be run to crosscut the east and west and north and south veins. The third shaft will be put down at junction of two veins near east side of group and a fourth shaft is also proposed.

The San Toy M. Co., near Santa Eulalia, propose putting in an aerial tramway from the mines down to within 2 miles of the Mexican Central Railroad.

The Chihuahua M. Co. has about finished its pipeline from Hacienda Robinson to the mines at Santa Eulalia, 13 miles distant, and the line and reservoir are expected to be in use by June 1.

M. V. Place, vice-president and general manager of the San Jose M., M. & Railroad Co., at San Jose del Sitio, states the name of the company has been changed to the Pittsburgh-San Jose R. & Co.

R. Emerson of Parral has denounced forty-four pertenencias of mineral ground north of the Las Minillas mines, 12 miles north of Chihuahua.

It is reported the Esperanza mine, in Palmillo Hill, near Parral, has closed down and the idea of striking the Palmillo vein given up.

Boyce & Burnham of Boston, Mass., have bought the Kruger mines at Cusi-huiriachic, the ores being gold-silver. The Moctezuma Lead Co. at Santa Barbara is treating 400 tons of ore daily in its concentrating plant, the increase being due to the putting in of heavier engines.

DURANGO.

The Coronado-Durango M. Co., with head offices in Chicago, Ill., and branch offices at the mines, has been organized; F. J. Lichtenherger of Chicago is manager. At Panuco de Coronado, near the Avino and San Luis mines, they have bought La Union, La Gran Sonora, Zaragoza and Peruana, and have options on several others, the price being reported at \$200,000.

The Penoles M. Co. of Mapimi report having struck coal in their coal land, 60 miles from that place, the diamond drill going through a 4 foot vein of coal at depth of 400 feet. A railroad to these lands is proposed by the company.

The Guggenheim Smelting Co. is reported having plans drawn up for a smelter at Velardina.

GUANAJUATO.

Concessions have been granted on the Guanajuato river, from Guanajuato to Silao, a distance of 15 miles, to G. W. Bryant of Guanajuato, manager of La Luz mines, to work the tailings which have accumulated in the river from patio operations.

GUERRERO.

C. Ackley, a prospector, reports finding in the mountains north of Limon deposits of cinchona which contain from 3% to 5% quicksilver.

OAXACA.

J. T. Franklin and H. M. Atkinson, of Waco, Texas, have bought twenty pertenencias in Zimiltan district, near Ayotlesco, 18 miles south of Ocotlan. They have named the group Franco-Mexicano and organized the Canadian-Mexican G. M. Co. of Waco, Texas. The ore carries values in gold and silver.

SAN LUIS POTOSI.

M. Seitz is operating sulphur mines near Carritos Guadalcázar from which he reports turning out 30,000 tons annually, worth \$22 gold per ton. Besides this, he is prospecting with diamond drill on 3210 pertenencias. Previous to the operation of these mines, the principal supply of sulphur for Mexico came from Popocatepetl.

SONORA.

Near Cucurpe, in the Magdalena district, C. W. Phillips and R. Lewis have located an antigua mine which they have named the Rey del Oro, and will begin development work next week. They have

sunk 200 feet and gone below the old workings, opening a 20-foot ledge of free-milling gold ore, which assays \$13.93 per ton. A mill will be built near the mine.

At the Cerro Prieto mine, near Magdalena, preparations are being made for building a 100-stamp mill and cyanide plant.

M. Latz & Bro. have granted a working bond on their Jobaba mine, 8 miles northwest of Magdalena, to a company of Michigan men, who will develop it and erect a mill.

The 5-stamp mill on the mine of La Loralina M. Co., at Empora Camp, 60 miles east from Magdalena, will be increased to ten stamps, say Tener Bros. & Balch, of Magdalena, part owners. The shaft is 296 feet deep, and will be sunk to a depth of 400 feet, cutting the ore body there.

The Bufo M., M. & S. Co., of Los Angeles, Cal., are putting in a concentrating plant and reverberatory furnaces at their mines near Sahuaripa. The company will still ship its high-grade ore. Development work continues and a pumping plant is being put in.

L. Ginger of Colorado Springs, Colo., and Maine men have incorporated at Augusta, Me., the Gold Coin Meza Mexican M. Co. as a branch of the Gold Coin M., M. & P. Co., which has been operating in Yaqui district.

J. B. Farish, consulting engineer of the Creston-Colorado M. Co., of Las Minas Prietas, denies the reported sale of that company's property to J. W. Gates & Co., of New York.

PERSONAL.

J. B. FARISH, E. M., of Denver, Colo., is in San Francisco, Cal.

J. W. MALCOLMSON of El Paso, Texas, is examining mines in Mexico.

CURTIS H. LINDLEY of San Francisco, Cal., is at Shasta Springs, Cal.

F. J. BUCK has returned to Denver, Colorado, from Las Vegas, N. M.

H. SMITH, president Section 7 Oil Co., returned to Coalinga, Cal., last week.

E. T. WALLACE, E. E., has returned to Yreka, Cal., from San Francisco, Cal.

F. GROTEFEND, of Redding, Cal., is in San Francisco, Cal., on mining business.

M. J. SWISHER is superintendent of the Golden Age mines, near Walistreet, Colo.

TINGLEY S. WOOD of Leadville, Colo., is in San Francisco, Cal., on mining business.

F. L. JOHNSTON of Berkeley, Cal., has gone to Bisbee, Ariz., as assayer and engineer.

P. W. FLEMING, of Tucson, Ariz., is in Globe, Ariz., in the interest of Pacific M. & M. Co.

J. F. BRANDES of Denver, Colo., is examining mining properties near Georgetown, Colo.

G. J. BANCROFT, of Denver, Colo., has returned from examining mines near Yuma, Ariz.

H. W. TURNER of Cherry Hill, Cal., is at Hornbrook, Siskiyou county, Cal., examining mines.

W. S. BROWN of Fremont, Neb., is at Cherry Creek, Nev., examining the North Mountain mine.

L. D. BALL has resigned as superintendent Yreka M. & M. Co., at Rollin, Siskiyou county, Cal.

A. T. HANSEN of Laurium, Mich., of the Copper Glance M. Co., is in Bisbee, Ariz., on business.

G. S. GOODALE, mining engineer for the Victoria copper mine, near Mars City, Mich., has resigned.

H. A. COHEN of the Bully Hill mines and smelter at Winthrop, Shasta county, Cal., is in New York.

A. B. PANE of San Francisco, Cal., is making a tour of the mines of Butte and Shasta counties, Cal.

E. C. VORHEIS, superintendent of the Lincoln mine, near Sutter Creek, Cal., is in San Francisco, Cal.

H. H. DYER, of Leadville, Colo., is manager of the zinc plant of the Utah Metals Co., at Park City, Utah.

C. H. RICE is superintendent Yreka M. & M. Co., at Rollin, Siskiyou county, Cal., vice L. D. Ball, resigned.

W. E. SANDERS is vice-president and manager of the Pulaski G. M. & M. Co., operating near Sumpter, Or.

SUPERINTENDENT C. PUSHER of the

Mountain Maid mine at You Bet, Nevada county, Cal., is in Chicago, Ill.

F. C. CLARK of Salt Lake City, Utah, is superintendent Palmer-Holland group of mines, near Silver City, Idaho.

W. C. ADAMS, interested in the California mine, near Grass Valley, Cal., is in New York on mining business.

C. A. HOLLAND, of Sonora, Cal., superintendent of the Altadena and Starr King mines, is in San Francisco, Cal.

MANAGER KING of the Balsley-Elkhorn mines, near Baker City, Or., is at Baker City from Salt Lake City, Utah.

S. P. SMITH, JR., has resigned as superintendent Ocean Wave coal mine, at Williamsburg, Fremont county, Colo.

A. L. DICKERMAN has resigned as manager of the Utah Metals Co., operating the zinc plant at Park City, Utah.

J. L. JOSEPH, a mine owner and superintendent of the electric plant at Tonopah, Nev., is in San Francisco, Cal.

T. J. OSTER, interested in the Plattsburg group, at Loon Creek, Idaho, is in the East from Salt Lake City, Utah.

G. R. TUTTLE, superintendent of the Golden Gate mine, near Grass Valley, Cal., is in San Francisco on business.

A. S. CHASE, manager Sunrise M. Co., returned to Gold Basin, Snobomish Co., Wash., from a business trip to New York.

W. A. CLARK of Butte, Mont., is in Salt Lake City, Utah, from the mines of the United Verde C. Co., at Jerome, Ariz.

J. F. ATKINSON of Missouri is assistant professor of mathematics in the New Mexico School of Mines at Socorro, N. M.

J. ROSS, JR., superintendent of the Wildman-Mahoney mine, has returned to Sutter Creek, Cal., from Confidence, Cal.

J. H. MACKENZIE has returned to San Francisco, Cal., from an examination of mines at Hayden Hill, Lassen county, Cal.

E. R. ABADIE, superintendent of the Champion M. Co., has returned to Nevada City, Cal., from San Francisco, Cal.

C. R. DOWNS, superintendent of the Bunker Hill mine at Sutter Creek, Amador county, Cal., is in San Francisco, Cal.

E. M. BRAY of Ely, Nev., who is interested in the Nevada and New York copper mines, near Ely, is in San Francisco, Cal.

E. H. BENJAMIN, E. M., has returned to San Francisco, Cal., from the Golden Eagle mine, Hayden Hill, Lassen county, Cal.

J. WITHERLY, superintendent of the Socorro mine, southwest of Wickenburg, Ariz., is at Los Banos, Cal., for the summer.

F. C. LINCOLN of Colorado has been elected to the chair of metallurgy in the New Mexico School of Mines at Socorro, N. M.

J. H. TOWNE of Pendleton, Ind., vice-president Indiana G. & S. M. Co., operating near Georgetown, Colo., is at their mines.

J. STEWART is superintendent Ocean Wave coal mine at Williamsburg, Fremont county, Colo., vice S. P. Smith, Jr., resigned.

G. KELLOGG of Bakersfield, Cal., interested in the Kern river oil fields, is examining oil properties in Evanston, Wyo., oil district.

SUPERINTENDENT J. A. PARKER, of the El Dorado C. Co., is in Georgetown, El Dorado county, Cal., from San Francisco, Cal.

E. SMITH and W. P. DUNHAM, owners in the Consuelo M., M. & P. Co., at Dolores, Chihuahua, Mexico, are in Los Angeles, Cal.

WM. M. KERKHOFF of Minneapolis, Minn., is visiting mines in which he is interested at Batamote, near Bonanilla, Sonora, Mex.

A. N. BUTTS of San Francisco, Cal., who has had charge of the erection of a mill in Wisconsin, was in Denver, Colo., the past week.

PRESIDENT TODD, of the Quincy M. Co., returned last week to Boston, Mass., from a trip of inspection to their mines at Hancock, Mich.

G. A. BETHUNE has returned to San Francisco, Cal., from a trip to Searchlight district, Nevada, and Ballarat district, California.

H. JOHNS has resigned as manager of the Sunset mine of the Montreal & Boston C. Co. at Greenwood, B. C., and goes to Colfax, Wash.

S. JAMES has resigned as superintendent of the Arkansas Valley smelter at Leadville, Colo., and is general superin-

tendent of the smelter at Salida, Colo., and also of the Republic smelter at Leadville, Colo.

E. M. BINFORD, has resigned as superintendent of the Carls mine, near Eureka, Juab county, Utah, and has gone to Salt Lake City, Utah.

J. E. MILLER of San Francisco, Cal., part-owner in the West Point mine, at Deadman's Flat, near Grass Valley, Cal., is at Grass Valley.

F. FOURNIER, managing owner of the Dos Estrellas mine in El Oro camp, Mexico, Mex., is making an extended visit in the United States.

R. WHINNERAH, former superintendent of the Humphrey mill, Creede, Colo., will have charge of the Mountain Pride mill at Breckenridge, Colo.

E. S. SAFFORD, chief engineer and manager of the Pittsburg-San Jose R. & E. Co., returned to Chihuahua, Mex., from the East last week.

H. G. HEFFRON, formerly with the Bingham Con. Co. at Bingham, Utah, is manager of the Gold Roads mines and mill near Kingman, Ariz.

C. H. TALLMADGE is manager of the Golden Age group, near Wallstreet, Boulder county, Colo., owned by H. E. Simmons & Co. of New York.

T. H. OXNAM has been reappointed manager of the Palmarejo mines at Palmarejo, Mex., from which position he resigned some months ago.

A. E. STAHLER is manager of the Belmont-Middle Mountain-Fairplay group of mines at Winfield, Chaffee county, Colo., vice A. E. Bokman, resigned.

C. H. GITSCH has resigned as superintendent California mine, Park City, Utah, and will devote his attention to development of the Woodside group.

J. W. TAYLOR of Salt Lake City, Utah, is in Columbus, Ohio, on business connected with the Wild Bill M. Co. at Shantie, Beaver county, Utah.

J. C. CARERA of Mesilla Park, N. M., returned last week from an examination of the Encinillas mines, 50 miles east of Santa Rosalia, Chihuahua, Mexico.

H. T. POWER, superintendent of the Hidden Treasure drift mine at Sunny South, Placer county, Cal., has returned to the mine from San Francisco, Cal.

C. M. FUELLER, mining engineer, Denver, Colo., has returned there from a trip through Georgia and Alabama, where he has been examining mining properties.

T. MALTMAN of Angels, Cal., is in San Francisco, Cal., and will sail next week for Nome, Alaska, to take charge of the Anvil-Sunrise mine, in which he is interested.

W. BLAKEMORE, former superintendent of the Crow's Nest Pass Coal Co., operating at Fernie, Morrissey and Michel, B. C., is consulting engineer of the same company.

F. T. KELLY, superintendent of the I X L and Hidden Treasure mines, in the Greenhorn mountains, near Sumpter, Or., returned last week from an extended stay in Spokane, Wash.

G. D. DOVETON of Doveton & Purington, Denver, Colo., has left for Torres, Mexico, on metallurgical work for the Creston & Colorado Co., and expects to be absent about three months.

C. E. MAGNUSON, Ph. D., has been appointed to the newly established chair of physics and electrical engineering in the New Mexico School of Mines at Socorro, N. M. He is a graduate of the University of Minnesota, department of electrical engineering, and of the University of Wisconsin, where he was a fellow in physics.

Commercial Paragraphs.

THE Brown Corliss Engine Co. of Corliss, Wis., are looking for a number of good agencies to handle their work in different parts of the country.

C. M. FUELLER, mining engineer of Denver, Colo., reports that he is designing a 500-ton mill for Georgia, a 100-ton mill for Boulder, Colo., and a 150-ton mill for Old Mexico.

In a plant recently installed in the South by the Pneumatic Engineering Co., 123 Broadway, New York, the air lift system pumps 9,000,000 gallons of water per day from four 10-inch wells.

THE Alpine Con. G. M. Co., whose office is in Baker City, Or., and whose mines are near Sumpter, Or., has recently

placed an order through their manager, J. T. Grayson, with the Rison Iron Works of San Francisco, Cal., for a complete 20-stamp mill, to be operated by steam.

Books Received.

Report of Secretary of Mines for Tasmania for 1901-02, including reports of commissioners of mines, inspectors, geologists, etc. It forms an interesting volume descriptive of Tasmania's mineral resources.

"The Copper Hand Book," for 1902, by Horace J. Stevens. This is the latest edition of this valuable annual publication. It is devoted to a popular, scientific and practical description of copper mines and metallurgical works, and devotes considerable space to the uses of copper. The geology of copper deposits throughout the world is one of the most interesting features of the work, and the list of copper mines with accompanying data one of the most valuable. 600+82 pages. Price \$5 in buckram binding. Horace J. Stevens, publisher, Houghton, Mich.

The second edition of "Lindley on Mines" has been received, and forms two volumes constituting 2150 pages of valuable text on the mining law of the United States. The volumes are profusely illustrated and contain all the important mining decisions of the United States Supreme Court up to date. The work has been entirely revised, and as the author states, the new adjudications have been assimilated to the old sections, and where new subjects have been incorporated supplemental ones have been appropriately grafted into the treatise without disturbing the general plan of arrangement or the logical sequence of the sections. Where the subject under consideration would seem to justify or require it additional diagrams and illustrations have been utilized. It will be gladly welcomed by the legal profession everywhere, as the work is an undisputed authority on the important subject of which it treats—the mining law. Price in calf, \$15.00; Bancroft-Whitney Co., San Francisco, Cal.

Obituary.

C. SHAD, a pioneer miner and operator on the Comstock, died at Carson, Nev., on May 15. Deceased was 80 years of age and a native of Germany. He leaves a wife in San Francisco, Cal.

C. B. BARSTOW, a pioneer mining man of California, died May 13 at Glencoe, Calaveras county, Cal., of heart failure, aged 80 years. Deceased was a native of Maine and a graduate of Bowdoin College.

J. BENNETT, a pioneer miner of Sierra and Nevada counties, Cal., died at Grass Valley, Cal., May 14th. He was at one time interested in the Gold Hill mine, near Grass Valley. He served several terms as city trustee and one term as county tax collector. Deceased was born in Cambourne, Eng., in 1821.

W. H. RODDA died on May 9th at Kalgoolie, West Australia. Deceased was formerly interested in mines in Nevada county, California, having been superintendent of the French Lead mine, near Grass Valley. He was later superintendent of the property after it changed its name to the North Star. Deceased leaves a wife, two sons and two daughters.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

PNEUMATIC PRUNING SHEARS.—No. 143,578. Feb. 18, 1903. W. Young, San Francisco, Cal. This invention is designed for trimming and pruning trees, hedges and the like, and has reference particularly to such shears as are actuated by compressed air or other suitable impelling fluids. Its object is to provide a labor saving device which will be more powerful and more efficient than the hand actuated devices commonly in use. The whole apparatus is made light enough to be easily carried about by the operator and held in his hands, and manipulated above his head in the manner customary in pruning trees and shrubbery.

PNEUMATIC PRUNING SAW.—No. 143,579. Feb. 18, 1903. W. Young, San Francisco, Cal. This invention relates to improvements in apparatus for trimming and pruning fruit trees and the like, and has reference particularly to a portable sawing device which is operated by compressed air. Its object is to provide a convenient, light and portable engine and saw which may be easily held in the hands, and by which limbs and branches too large for pruning shears and inconvenient of access for hand sawing may be severed with ease and in far less time than they could have been by ordinary pruning or hand sawing methods.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MAY 12, 1903.

727,871.—MILEAGE TICKET HOLDER—E. R. Allen, Prescott, Ariz.
727,880.—TELEPHONE DIRECTORY—L. M. Bannan, S. F.
727,736.—DENTAL DRILL—C. R. Basford, Healdsburg, Cal.
728,153.—GAS REGULATOR—G. S. Bennett, S. F.
727,739.—CROSS HEAD—F. H. Blanding, S. F.
727,743.—OIL COCK—Brunner & Patterson, Hayward, Cal.
727,745.—CORNICER BREAKS CUTTER—G. R. Hyde, Fresno, Cal.
727,759.—WIPE ROPE SOCKET—Double & Katten, Los Angeles, Cal.
728,096.—SPIKE PULLER—O. Giltner, Portland, Or.
727,958.—ORE CRUSHER—J. A. Johnson, Los Angeles, Cal.
728,115.—INK WELL HOLDER—J. C. Killey, San Diego, Cal.
727,802.—STAMP MILL—C. C. Lane, Los Angeles, Cal.
727,993.—BATH BRUSH—T. L. Newport, S. F.
728,127.—BOTTLE—M. & M. B. O'Meara, S. F.
728,036.—LETTER STAMPING MACHINE—J. N. Stacy, Portland, Or.
727,712.—AWNING—F. Thomas, S. F.
728,147.—TELEPHONE SELECTING DEVICE—W. D. Watkins, San Jose, Cal.
728,068.—PNEUMATIC PRUNING SHEARS—W. Young, S. F.
728,069.—PNEUMATIC PRUNING SAWS—W. Young, S. F.

Latest Market Reports.

SAN FRANCISCO, May 22, 1903.

METALS.

SILVER.—Per oz., Troy: London, 26d (standard ounce, 925 fine); New York, bar silver, 54½c, refined (1000 fine): San Francisco, 54½c; Mexican dollars, 40 @ 42½c San Francisco, 43c New York.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50 @ 14.75; Electrolytic, 1 to 3 casks, \$14.50 @ 14.75; Casting, 1 to 3 casks, \$14.50 @ 14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £62 12s 6d spot per ton.

Copper remains unchanged, the demand and output seemingly being without material fluctuation.

The following gives the figures of the consumption of foreign copper in Germany for January-March, 1903, compared with the same period of 1902 and 1901:

	1903	1902	1901
Imports, tons.....	19,590	17,427	16,502
Exports, tons.....	2,942	2,298	2,389

Consumption, tons.....16,648 15,129 14,113

LEAD.—New York, \$4 37½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½; pig, \$4.75. London: £11 12s 6d per long ton=2.75c per lb.

SPELTER.—New York, \$5.75; St. Louis, \$4.60; London, \$2.00 17s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$29.45 @ 29.65; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33c; bar tin, \$35 @ 37½c. London, £134 spot.

PLATINUM.—San Francisco, crude, \$18.00 @ 19c; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$45.50 @ 46.00; large lots; London, £8 15s; San Francisco, local, \$45.00 @ 46.00; 76½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 31c.

SOLDER.—Half-and-half, 100-lb. lots, 20½c; San Francisco, Plumbers', 100-lb. lots, 17.15c.

NICKEL.—New York, 50 @ 60c @ 1b.; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$20.60 @ 21.50; gray forge, \$19.85; San Francisco, bar, 3c @ 1b., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$31.50; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$22.00 @ 22.50
Foundry Northern 1.....	22.00 @ 22.50
Northern 2.....	21.50 @ 22.00
Northern 3.....	21.00 @ 21.50
Southern 1.....	21.35 @ 22.35

Southern 2.....	20.85 @ 21.85
Southern 3.....	20.35 @ 21.35
Forge.....	19.85 @ 20.85
Charcoal.....	26.00 @ 27.00
Billets, Bessemer.....	33.00 @ 34.00
Bars, iron.....	1.85 @ 1.90
Bars, steel.....	1.75 @ 1.80
Rails, standard.....	28.00 @ 30.00
Rails, light.....	34.00 @ 40.00
Plates, boiler.....	1.90 @ 2.00
Tank.....	1.75 @ 1.90
Sheets, 26 store.....	2.90 @ 3.00
No. 27.....	3.00 @ 3.10
No. 28.....	3.10 @ 3.20
Angles.....	1.75 @
Beams.....	1.75 @
Tees.....	1.80 @
Zees.....	1.75 @
Channels.....	1.75 @
Steel melting scrap.....	18.50 @ 19.00
No. 1 railroad wrought.....	19.50 @ 20.50
No. 1 cast, net ton.....	17.50 @ 18.00
Iron rails.....	24.50 @ 24.50
Car wheels.....	24.00 @ 24.50
Cast borings.....	9.00 @ 10.00
Tunings.....	14.00 @ 14.50

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.25; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 1½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, 3c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

CHEMICALS.—Cyanide of potassium, 98½-99½, jobbing, 25 @ 26c @ lb.; carloads, 23 @ 24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½ @ 2½c @ lb.; caustic soda, in drums, 3 @ 4c @ lb.; Cal. s. soda, bbls., \$1.25 @ 1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12 @ 13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; horax concentrated, 7 @ 8c @ lb.; roll sulphur, 4 @ 6c; powdered sulphur, 2 @ 3c; flour sulphur, French, 2 @ 3c; alum, \$2.00 @ 2.25; California refined, 2 @ 2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5 @ 7c; chloride of lime, spot, \$2.50 @ 2.75; sulphuric acid, in carboys, 66½ B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9c per lb.

BONE ASH.—Extra No. 1, 5 @ 6c per lb. No. 1, 4 @ 5c.

BORAX.—Concentrated, 7 @ 9c per lb. powdered, 9 @ 12c; fused, 25 @ 30c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5 @ 7c.

MANGANESE.—Pure, 1½ lb., 60c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

BISMUTH.—Subnitrate, per lb., \$1.60.

SODIUM.—Metal, 1½ lb., \$1.00.

MERCURY.—Bichloride, 1½ lb., 90c.

PHOSPHORUS.—(American) 1½ lb., 75c.

SILVER.—Chloride, 1½ oz., 90c @ \$1.00; nitrate, 55c.

URANIUM.—Oxide, 1½ lb., \$3.50.

ZINC.—Metallic, chemically pure, 1½ lb., 50c; dust, 1½ lb., 10c; sulphate, 1½ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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Copper Production in Lake Superior Region.

All who are at all familiar with the mining world know more or less of the Lake Superior copper mines. They are noted for their long continued and large output and for the great depth to which some of the mines have been worked (4938 feet the deepest shaft, the Tamarack No. 5). The district at present is producing about 350 tons of metallic copper daily,

years since. It has been frequently stated that the Homestake mines in South Dakota have about 900 stamps crushing over 3000 tons of gold ore daily, and the Alaska-Treadwell has 540 stamps crushing about 2000 tons daily.

In the Lake Superior region 75 steam stamps crush every 24 hours from 350 to 500 tons per stamp, in the aggregate crushing of the entire output of the mines as stated above—27,000 tons. In the crushing and concentration of this large amount

will be about 4900 feet vertical below the collar of the shaft. The Tamarack mine has five shafts, all of which are vertical. No. 1 cuts the conglomerate at 2270 feet; No. 2 is 4250 feet deep; No. 3 is down 4799 feet; No. 4 is 4450 feet deep, and No. 5, the deepest vertical shaft in the world, is 4938 feet below the surface. It was commenced in August, 1895, and reached the conglomerate in December, 1901, at 4662 feet. The Calumet & Hecla mine is the largest and most extensively operated mine in the Lake



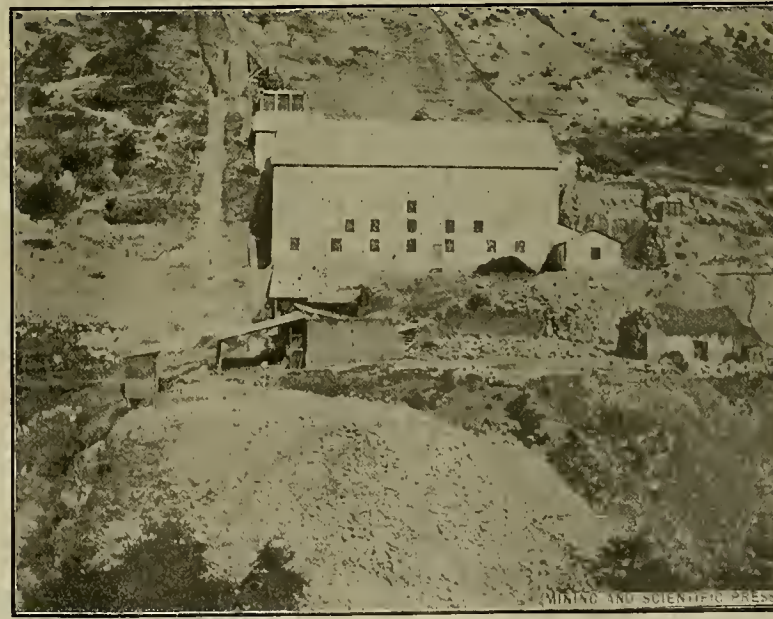
Upper Terminal, Tramway Nimrod Syndicate, La Quinua, Peru.



Ore Bin, Nimrod Syndicate, La Quinua, Peru.



Town of La Quinua, Peru.



Mill of Nimrod Syndicate, La Quinua, Peru.

nearly all by wet concentration, there being little copper ore in the district which does not occur in the form of native metal. The output has fluctuated largely in the past, but at present is the heaviest ever made since the discovery of the mines. The daily shipments of ore from the mines to the mills, some of which are many miles apart, now aggregate nearly 27,000 tons, and nearly all of this is mined underground from veins only a few feet in width.

Where large tonnage is mentioned in mining operations, one usually thinks of large open cuts or quarries; but the Lake Superior mines, with few exceptions, passed the surface-mining stage many

of ore, nearly 320,000,000 gallons of water are required, or about 50 tons of water for each ton of rock crushed, as compared with 3½ to 5 tons employed in stamping ordinary gold ore. A large amount of this water is used in the various concentrating operations through which the ore passes after crushing. Some of the pumping plants at these mines have a capacity of exceeding 130,000,000 gallons daily.

The temperature at the bottom of some of the deepest shafts is 75° to 80° F., after connection had been made with distant shafts by means of levels. The Calumet & Hecla No. 4 shaft, an incline, is 6900 feet deep. It is intended to sink to 8100 feet, which

region, and produces more than 50% of the output of the district, and about 8% of the entire output of the world. The rock at present contains about 2½% metal; or 50 pounds metallic copper to the ton of ore. The working force of the mine is about 5000 men, including miners, mill men, smelters, those engaged in transportation, the hydraulic branch, clerical force, etc.

In Lake Linden, where the tailings from the Calumet & Hecla mine have accumulated, it is estimated there are 25,000,000 tons of sand which contain from 0.5% to 1% of metallic copper. Experiments are being made with a view to reconcentrating.

(See page 349.)

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San Francisco, May 30, 1903.

TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Upper Terminal Tramway, Nimrod Syndicate, La Quinua, Peru.....	345
Ore Bin, Nimrod Syndicate, La Quinua, Peru.....	345
Town of La Quinua, Peru.....	345
Mill of Nimrod Syndicate, La Quinua, Peru.....	345
Type of Melting Furnace.....	348
The Cummer Dryer.....	349
Hints on Rubber Belting.....	350
Method of Clamping and Lacing a Belt.....	351
Man Lift in Silver Lake Mill, Silverton, Colo.....	352
Geology of Cananea, Mexico.....	352
Mining and Metallurgical Patents.....	353
EDITORIAL:	
Copper Production in Lake Superior Region.....	345
The Passing of a Mine.....	346
"Pure Food Law" of Idaho.....	346
Value of Mine Surveys.....	346
The Labor Situation.....	346
Gwin Mine Annual Report.....	346
MINING SUMMARY	354-355-356-357
LATEST MARKET REPORTS	359
MISCELLANEOUS:	
Concentrates.....	347
An Improved Form of Melting Furnace.....	348
Michigan College of Mines.....	348
Economic Geology in Georgia and North Carolina.....	348
The Adams Lake Series, British Columbia.....	348
The Commercial Assay of Lead Ores.....	343
Mining in Peru, South America.....	343
The Cummer Dryer.....	349
Geology of the District West of Redding, Cal.....	343
Hints on Rubber Belting.....	350
Regeneration of Cyanide Solutions After Zinc Precipitation.....	351
A Man Elevator.....	352
Gold in Georgia.....	352
Geology of the Cananeas.....	352
Mining and Metallurgical Patents.....	353
Books Received.....	358
Personal.....	358
Commercial Paragraphs.....	358
Obituary.....	358
Catalogues Received.....	358
New Patents.....	358
Notices of Recent Patents.....	358

The Passing of a Mine.

Recent press dispatches state that the Cliff copper mine in Keweenaw county, Mich., is to be dismantled, after an idleness of many years. The Cliff was one of the noted early mines of the Lake Superior copper region. It was not on one of the conglomerate or amygdaloid beds, but upon one of the fissure veins of that interesting district. The fissure is said to have been worked out, or, at least, worked until it was no longer profitable. It paid its first dividend in 1849. The Cliff mine in its early history was a noted producer of mass copper. The large and profitable production of metallic copper by a number of mines in the Lake Superior region has been a powerful stimulant to the deep exploration of mines in that district. Not all of these enterprises have proven all that had been hoped for them, but a fair percentage have proven remunerative. Recently it has been said that with great depth the copper-bearing conglomerates show poorer values than nearer the surface, but it has not yet been proven that this is not merely a local condition, and that an improvement may not occur at still greater depth. Great mines have been closed before, and in some cases they have been reopened with satisfactory results to the operators, but in the case of the Cliff mine, the impression seems to prevail that it has actually been worked out.

THE recent session of the Idaho Legislature passed what is known as the "Pure Food law," in which a clause of the act prohibits the sale of oil and gasoline less than 150° fire test. Gasoline used in engines is usually far below this point, being generally from 70° to 80°. This act has resulted in shutting down several mills where gas engines were used for power. While it is always desirable to have illuminating oil and other petroleum products as high proof as necessary, it is not absolutely clear how these commodities came to be classed as "pure food."

Value of Mine Surveys.

Mining engineers know and appreciate the value of accurate mine surveys and maps, and most mines have maps which will answer all practical purposes, but there are those without them. A full set of maps must embrace level maps, and vertical longitudinal and vertical cross-sections of veins which have any considerable dip.

It is the practice to plot a general plan of the "underlay" on a single sheet, showing each level in the mine, with all its details of development, winzes, raises, crosscuts and stopes, each being indicated by characteristic marking. The idea of projecting plan and vertical section on a single plane, as attempted occasionally, is unsatisfactory, and is never done by those familiar with the principles of mine mapping. The scheme of mapping each level separately, each level map drawn to a certain datum, is an excellent one, and tracings of these several level maps may be made, which admits of binding them together permanently or temporarily, and the lines showing the several levels may then be examined simultaneously by placing the sheets one above another, and the relative position of the workings on adjacent levels studied.

By plotting all the development work, and also the structural geological features (such as changes in character of rocks through which the workings pass, the dip of the formation, all dikes intersecting the workings, cross veins, seams, faults and gouges, together with their strike and dip), the maps may be made to serve their greatest usefulness. The breaks in the vein, which occur on any particular level, may be referred to levels above and below, as does any other geological irregularities which may occur. The lack of just this sort of knowledge has sometimes resulted in closing mines subsequently proven to be valuable.

Never, perhaps, is an accurate mine map appreciated so greatly as upon the reopening of a long abandoned property. Such mines are usually flooded, and when new work is undertaken, as connecting with works of an adjoining property, or sinking a new shaft to be connected with the old workings, the element of danger which attends such operations, owing to large volumes of water in the old works, is reduced to a minimum. The manager knows how far he is from the old levels or stopes, and can anticipate imminent danger and provide against it.

Accurate maps are also of great service in searching for new ore shoots, as by their use a comprehensive idea of the entire vein may be obtained, for a glance at the map places the development of several thousand feet possibly immediately under the eye, and the relations of the various portions of the mine become apparent.

The Labor Situation.

There are at present said to be more idle men in industrial lines than at any time since the coal strike of 1902. The number is estimated at more than 50,000, mostly in the States east of the Rocky mountains. On the Pacific coast there are a few hundred railroad and other laborers idle—on strike. In the mines of the West, however, there is no disturbance of moment, except in the coal mines on Vancouver Island.

In Arizona the eight-hour law passed by the last territorial Legislature becomes operative June 1st, and the developments of the immediate future are looked forward to with some concern by mine managers and owners in that Territory. It is reported from several districts of Arizona that the operators will not deny the demands of the miners should they attempt to insist upon putting the law into active operation, but miners throughout the Territory have been notified that beginning June 1 wages will be reduced 25 to 50 cents per day, the present rate being \$2.75 and \$3.50. This step was taken at a recent meeting of the Mine Operators' Association, presumably in anticipation of the proposed eight-hour day. The convention of the Western Federation of Miners, in session at Denver, Colo., has instructed delegates from Arizona to accept no reduction in wages, consequently the outlook for continued prosperity in Arizona is not bright.

In California the miners in Calaveras and Amador by the recent strike secured a nine-hour day for

ten hours' pay, and it is now stated to be the intention to demand an eight-hour day for the same pay. They are in the meantime strengthening their organization, and notices have been posted in the several mining towns and at the mines, in the English, Italian and Austrian languages, directing all men employed in or about the mines who have not already joined the union to at once affiliate themselves with some labor organization, or they will be boycotted as "scabs."

There are few of the mines in the district affected by this movement that can afford any additional expense, and a demand for still shorter hours would undoubtedly result in closing some of the mines of the district, with the further probability that in the case of some of them they would not again be reopened by the present generation.

In view of the present situation, it is hoped that wiser counsel will prevail and that the miners will see the inadvisability of adding to the burden of expense under which these mines are already struggling.

Gwin Mine Annual Report.

The annual report of the Gwin mine, Calaveras county, Cal., for the year ending March 31, 1903, has just been issued, and shows some interesting figures as to total cost in mining and milling, and also in the several departments of the mine. The report, while giving an itemized statement of costs, makes no mention of the results obtained, but this fact does not in any manner affect the cost of operating. The Gwin mine is worked through a well equipped vertical shaft, about 1800 feet in depth. The mill has 100 stamps and the rock is somewhat softer than the average of the mines of this portion of the California gold belt. The vein varies from 4 or 5 feet to over 20 feet in width. The workings are promptly and substantially timbered and the practice of filling is carried on as close after stoping as convenient, as the ground is very heavy and cannot be held with timbers alone. The management is progressive, and many innovations and labor-saving devices have been introduced. Following is the report of the secretary for the fiscal year ending March 31, 1903:

ITEMS.	Mined and sent to the mill, 135,033 tons.	Cost per ton.	Milled and concentrated, 135,393 tons.	Cost per ton.
Management.....	\$ 3,711.40	\$.02689	\$ 3,912.70	\$.02827
Offices.....	2,680.00	.01941	1,243.00	.00888
Labor.....	154,037.60	1.11534	10,332.73	.07343
Water.....	6,006.60	.04351	3,066.63	.06552
Electric Light.....	435.00	.03151	433.00	.00317
Wood.....	1,227.13	.00830	82.60	.00328
Timbers.....	40,078.32	.23035		
Lagging.....	10,565.08	.07654		
Wedges.....	1,375.45	.00936		
Lumber.....	278.14	.00201	72.45	.00052
Powder.....	7,345.61	.05243		
Fuse.....	1,157.93	.00833		
Caps.....	362.17	.00625		
Track iron.....	3,624.06	.02625		
Drill steel.....	1,308.00	.00348		
Iron and steel.....	388.60	.00281	3.89	.00003
Hardware.....	2,463.36	.01789	125.44	.00030
Steam coal.....	892.00	.00646		
Charcoal and coke.....			43.20	.00031
Oils and lubricants.....	310.69	.00225	108.05	.00078
Shoes and dies.....			6,080.35	.04394
Screens.....			131.43	.00035
Belting & driving rope.....			96.00	.00063
Chemicals.....			72.37	.00052
Quicksilver.....			612.38	.00377
Miscellaneous supplies.....			449.75	.00325
Surveying.....	564.50	.00438		
Assaying.....	184.60	.00134	1,032.90	.00746
Blacksmith shop.....	2,736.35	.01382		
Pumps and repairs.....	2,568.26	.01860		
Power drill extras.....	1,600.00	.01153		
Expense.....	781.31	.00566	201.92	.00145
*Mine equipment.....	5,302.00	.03848		
*Construction.....	1,737.00	.01258	5,708.00	.04121
*Development work.....	3,750.00	.02716		
Taxes.....	3,250.00	.02303	1,028.92	.00742
Teams and stables.....	1,442.25	.01045	60.00	.00043
*Compressor.....	4,368.73	.03600		
Telephones and line.....	37.50	.00070	21.53	.00016
*Gen. improvements.....	373.00	.00703	480.00	.00347
Bullion expressage.....			445.23	.00321
	\$268,383.75	\$1.34430	\$42,357.36	\$0.30608

* 1% per month written off these accounts for deterioration.
† Apportioned according to its estimated life or utility.

There were 2010 831 tons sulphurets (less moisture) produced. Wagon and railroad freight, loading wagons and cars, and Selby Co.'s charges amounted to \$21,981.17, being \$10.331 per ton of sulphurets or \$0.1588 per ton of ore milled.
Total cost of production and treatment per ton of ore: Mining and development work, \$1.9443; milling and concentration, \$0.30608; sulphurets, Selby's charges, etc., \$0.1588. Total, \$2.4031.

It is stated by the English press that the government of the Malay States will impose a duty on tin stone exported from the Straits mines, the object being to discourage the shipment of tin ore from those mines to America for reduction, and to encourage the erection of reduction works on the peninsula for the treatment of the ores there. This may be true, but it seems improbable. It is further stated that tin bars or plate produced in the Malay districts will not have to pay any export duty.

CONCENTRATES.

It is never safe to buy stock in a corporation which pays an unearned dividend.

A TEMPERATURE of 302° F. in a boiler is equivalent to a gauge pressure of 55 pounds.

WITH suitable nozzle, a good hydraulic giant, under 265-foot pressure, would throw 500 inches water.

THERE is no legal authority under which public lands may be leased from the Government for mining purposes.

AT 30 inches barometric reading, a troy pound of distilled water equals 22.7944 cubic inches; avoirdupois, 27.7015.

SOUND has been transmitted by the rays of a searchlight a distance of 4 miles, and the radiophone has been in use for some time, but not in a practical way.

A "STORAGE BATTERY" does not store electricity. Electricity can no more be "stored" than can sunshine. What is called a "storage" battery is really a reversible battery.

AN individual can relocate "his own mining claim" under an assumed name, without violating any statute; but there are some things concerning which statutes should be unnecessary.

WHERE both parties claim under the same location neither one can contest its validity. A location may be made by an agent, and this without the knowledge or consent of the principal, if he afterwards accepts the location.

THE rock specimens from Argenta, Montana, are white quartz, slightly stained with iron oxide. The lead-colored mineral with metallic luster is molybdenite, (sulphide of molybdenum); the silvery-white scales are muscovite mica.

WHEN a mill is built of lumber that has not been thoroughly seasoned it is well to line up the shafting occasionally during the first year or two, as the tendency of some timber to warp upon drying will throw shafting out of line.

A PART owner of a patent has the legal right to convey to others the right to use, make and vend the patented article without the consent of his co-owner, and the latter cannot maintain a suit for infringement against the grantees.—108 Fed. Rep. 77.

THE ore sample from Jacksonville, Or., is specular iron, a variety of hematite. It is doubtless a good quality of ore, but the vein described is too small to be commercially valuable for iron. It may contain gold, as this ore sometimes does in gold mining regions.

THE specimens received from Kernville, Kern county, Cal., are native antimony, which rarely occurs native, there being not more than a half dozen localities cited by the authorities. They are chiefly valuable owing to the rarity of the occurrence of the native metal.

THERE are engines now running which can take a train of 300 tons, exclusive of the weight of the engine and tender, along a straight, level road at the rate of 50 miles an hour for as long a time as the supply of coal and water will hold out—not a spurt, but a long-sustained effort. The same engine is quite capable of developing over 1000 I. H. P.

HOISTING ROPES are made usually of six strands of nineteen wires in each strand, the several strands grouped around a tarred hemp core. An inch rope of this description weighs 1.6 pound per running foot. A rope 1½ inches diameter weighs 2.5 pounds per foot. The latter rope, made of crucible cast steel, would have a breaking strain of about fifty-five tons.

"BALL STAMP" is the name given to the heavy steam stamps employed in the crushing of the metallic copper-bearing rock in the Lake Superior region. These stamps weigh each several thousand pounds and have a capacity of 500 tons and upwards per day. When it is said a mill has "three heads" in operation it is meant that three Ball stamps are crushing ore.

A HOISTING ENGINE may be set directly upon the concrete or masonry foundation, (former preferred). The bed plate may be set in place and raised slightly by placing thin metal shims, ½ to 1 inch thick, depending on width of bed-plate, and run in a thin mixture of cement and sand, which should be carefully spread under the bed-plate and so arranged that it will completely fill the space. Allow to set for several days before running.

NEITHER the laws of Arizona or of any other State or Territory require that additional assessment work be done on a mining claim when an amended location is made unless the change in boundaries of the claim result in placing the work already accomplished entirely out-

side of the limits of the amended location. The amended location must be recorded, and any work previously done under the original location stands for the amended location.

WHERE a director of a corporation performed services as its manager, not pertaining to his duties as director, he is entitled to recover the reasonable value of such services, though no rate of compensation was fixed by the board of directors prior to performance of the services. No legal quorum of directors of a corporation is present when action is attempted to be taken on a matter as to which one of the directors necessary to make the quorum is interested, and resolutions passed at such meeting can not be ratified by the stockholders.—64 Pac. Rep. (Cal.) 1082.

WHEN A locates one or more mining claims the title rests in him, and if he subsequently transfers an interest in these claims to B and C the title still rests in his name, but the transfer should be placed on record, the same as any transaction in real estate, and this secures B and C in their interest in the claims. It is not necessary that the names of B and C appear on the location notice. An amended location notice and record of same may be made, but this is unnecessary. B and C, however, become equally responsible with A for continuance of annual assessment work.

IN any system of incandescent lighting by multiple arc, or parallel arrangement, when one lamp is on, the resistance is such that only the current required for that lamp can flow; when two lamps are turned on, the resistance is half of what it was before, and twice as much current flows. More power is therefore required of the generator. If no lamps were lighted, the generator would not be called upon for any current, and it would run free, offering no resistance to motion except the friction of its armature shaft. This is true of all dynamos, alternating or direct.

GRAPHITE is pure carbon when the mineral itself contains no impurities. It occurs massive, earthy and crystalline, often found in disseminated grains and scales in slates, granite, limestone and other rocks. The mineral may be concentrated and both wet and dry processes are used for this purpose, the former being preferred. The ore is crushed wet by means of stamps, followed by a rough concentration on stationary buddles, the concentrates being dried and further crushed and ground with buhr stones. In some mills the mineral is obtained by collecting the graphite from the surface of the water, where it floats after fine crushing.

ALUMINUM is manufactured from its oxide by electrolytic decomposition. Its specific gravity is 2.68. Its tensile strength varies from 22,000 to 30,000 pounds per square inch. Its electrical conductivity is higher than that of any other common metal, excepting copper, in proportion to its cross-section, and is more than twice as great as copper for equal weights. The relative price is determined by the electrical conductivity. Aluminum conductors will cost the same per mile as copper of equal conductivity if the price per pound of copper is 47.77% of the price per pound of aluminum. Copper wire, for electrical purposes, at 15 cents per pound, is equal to aluminum wire at 31.4 cents.

THE silver ores of California usually carry little gold, sometimes none at all, as in the Calico district, San Bernardino county. In the lead-silver ores and other ores containing sulphides, carbonates and oxides of the base metals, with silver values, gold is usually present and in some cases amounts to more than the silver. It has not been demonstrated that there is definite ratio of gold to silver in any of the California ores. This particular phase is more characteristic of districts than of certain ores. It would be quite possible to find silver values ranging from 7 ounces to 12 ounces, with merely a trace of gold, though no such occurrence is known to "Concentrates" in Calaveras county, Cal.

PHOSPHORUS is an element, widely distributed, occurring only as phosphates. It is present in sea water in minute quantity, but no attempt, so far as "Concentrates" knows, has been made to extract phosphorus from sea water. The phosphorus of commerce is obtained by treating burned bones with sulphuric acid, when an insoluble calcium sulphate and a soluble acid calcium phosphate are formed. The solution of acid calcium phosphate is filtered, evaporated to dryness, and the residue is heated to change the acid salt into the metaphosphate. The calcium metaphosphate is then intimately mixed with charcoal and heated to redness in earthen retorts and the phosphoric vapor is condensed in water. Phosphorus is also manufactured from mineral phosphates. Phosphorus is insoluble in alcohol and water. Because of its inflammability it is kept under water.

IN the Transvaal, South Africa, the ore-bearing formations follow a plane parallel to the sedimentary deposits and dipping slightly to the south. Considerable drilling has been done to demonstrate the value of the reef at great depth. The deepest hole drilled has a depth of 4800 feet, and at that depth found the reef with good values at a point only 25 feet from that at which it was theoretically expected that the reef would be cut. This hole was started before the war, in January, 1899; but at the beginning of October, 1899, on account of the war,

the company was obliged to stop working. For twenty months the rods were left idle in the hole. The work of sinking deeper was resumed in January, 1900, and continued until the depth of 4800 feet was reached and the permanency at that depth of the rich deposits of the Rand mines proved. The hole was put down in 10½ months of actual drilling.

F. L. BOSQUI recommends as a suitable flux for cyanide precipitate after acid treatment: With every 100 parts of precipitate is mixed 50 parts of a flux containing 4 parts borax, 2 parts soda and 1 part sand, but as he says, owing to the complex character of the zinc precipitate, a suitable flux can only be determined after a good deal of practical experiment. On this same subject Alfred James says: "The fluxes used (in smelting auro-cyanides) vary at each works in accordance with the condition of the slimes. When these are fairly pure they are melted with one-third to one-half their weight of fused borax and about one-tenth sodium carbonate; to this is added a little sand if necessary. Zinc, copper or other metallic impurities require the addition of more borax; old slags from previous fusions are added with advantage. Fluorspar is sometimes used. The borax should be ground borax glass."

THE smelting of antimony ore is attended with difficulty, and but few metallurgists are thoroughly familiar with the details of modern practice. In a general way, it is sufficient to state that the sulphide of antimony (stibnite), which is the principal ore of the metal, is melted with wrought iron scraps, in which the sulphur of the stibnite combines with the iron, leaving the metallic antimony, or the ore is roasted, whereby the sulphur burns to dioxide, and the antimony becomes an oxide, which is reduced by fusion with coal. The molten metal after being purified is poured, together with an easily fusible slag, into a heavy iron mold. The antimony solidifies first and its upper surface is characterized by a network of fern-like forms—an incipient crystallization, which is required by buyers as an evidence of the purity of the metal. The United States Geological Survey reports no antimony ores mined in the United States in 1902.

THE most common terms in use to represent electrical units are the ohm, the volt, the ampere and the watt. These were given international standard value by the International Electrical Congress in Chicago, 1893. As fixed by that convention, the ohm is represented by the resistance of a column of mercury, at 32° F., of a mass of 14.521 grams, and of constant cross-section throughout the length of 106.3 centimeters. The international ampere is represented by the constant current which, when passed through a solution of nitrate of silver in water, of a certain percentage, will deposit silver at the rate of 0.001118 gram per second. The international volt is that electro-motive force which will produce a current of one ampere through a resistance of one ohm, and is represented by 1/1000 of the electro-motive force between the terminals of a dark cell. The watt is the amount of work done per second by a current of one ampere through a resistance of one ohm.

TO DETERMINE the amount of lead in an ore, where because of an unusual percentage of copper the ordinary fire assay is not satisfactory, the ore or matte is first treated with nitric acid, the solution then diluted and filtered, precipitation effected by sulphuric acid, throwing down sulphate of lead, sulphate of baryta, sulphate of strontia and sulphate of lime. The precipitate is then washed down to the point of the filter with water, to which two drops of sulphuric acid are added, then dried. The dry precipitate is placed in a small clay annealing cup, the filter ignited, the ashes added to the precipitate in the cup. Cyanide of potassium, equal to about five times the weight of the precipitate, is then added and the whole of the contents of the cup fused at a low heat over a spirit lamp. The lead sulphate is soon reduced to metallic lead, settling in the bottom of the cup. The cup is allowed to cool, and then, with the contents, placed in a porcelain dish with water. The cyanides then dissolve, leaving the metallic lead, which is dried and weighed.

THE resistance which a flywheel offers to the air may give rise in some cases to a considerable waste expenditure of energy. In experiments at a station at Nuremberg, Germany, where two tandem compound engines of 450 H. P., direct coupled to the dynamos, were working at ninety-five revolutions per minute, to equalize the running with the great variations of load which occur, a very heavy flywheel was used with the arms of a channel section. These arms were found to offer a great resistance to the air, and to create a powerful draught. It was decided to cover the wheel with sheet iron to reduce the resistance and thus gain power. To test the amount of energy lost, the dynamo was made to run as a motor and thus drive the engine and flywheel at no load. When the latter had no protecting cover it was found to absorb 13,300 watts, but when the covering was replaced it took only 9874 watts, thus showing a gain of 3426 watts, or 5.7 H. P., this being 1.2% of the power of the engine. Counting the current price per kilowatt hour and a day's run of seventeen hours, it was calculated that this represented an economy of nearly \$300 annually. Another test of a similar nature was made upon a 630 H. P. engine, and showed an economy as high as 30 H. P., or 4.8% of the engine power, which was gained by properly diminishing the air resistance of the flywheel.

cause the series is found both east and west of the river.

Although much of the earlier geological arrangement in the Cordilleran system was very provisional in character, the new series of research beginning in 1894 shows a better and clearer conception of conditions, and the time is not far distant when we shall witness more correlation of the rocks north and south of the international boundary line than has prevailed heretofore.

This subject is invested with unusual interest. Dr. Dawson himself was of the opinion that rocks found in the Cambrian strata near Adams lake have their representatives in California. This statement adds very much to the interest taken in this subject by practical mining men who know the value of scientific comparisons which are based on demonstrated truths.

I shall endeavor at some future period to present a fuller and more particular review of this question for the information of the readers of the MINING AND SCIENTIFIC PRESS.

Upon the theory of dynamic metamorphism what appears to be impossible conditions may be satisfactorily explained. This seems to have advanced very close to a practical demonstration in the light of recent investigations in the Rocky mountain region.

The Commercial Assay of Lead Ores.*

Written by W. A. JOHNSTON.

In reviewing the article of Mr. Warwick on "The Commercial Assay of Lead Ores," it seems to me that it is not as thoroughly scientific as it should be, and it certainly is inaccurate and misleading. It starts out by saying the fire assay is so inaccurate that it is a wonder the sellers of ores have made no organized resistance to the fire assay, leaving us to infer that the buyers object to this method, while as a matter of fact the smelters want accurate assay methods. Many years of experience in comparing assays for settlement convince me that the smelters get no advantage by fire assay.

It is not a fact that all smelters use both the chemical and fire assay, being careful to adopt that method which gives the lowest results. Such a statement would argue that the miners were devoid of ordinary intelligence and the smelters were oblivious to all sense of decency and fairness. The smelter does not object to either method, but does object to using both methods on the same ore and settling on the one that gives the highest results.

It is not a fact that smelters are buying Breece Hill and Lillian mine ore on chemical assays and all other ores on fire assay. In some cases of ore containing bismuth the volumetric assay is used, because the miner would get more for the bismuth than for the lead, and besides, bismuth is considered undesirable in smelter mixtures and a detriment to the quality of the lead.

The article says: "It is notorious that the fire assay for lead ores becomes increasingly inaccurate as the ores become more complex and lower grade" (lower grade in lead). No. 1 sample carried 10½% by volumetric and 9½% by fire assay, a difference of 1%. No. 7 carried 20.6% by volumetric and 17.6% by fire method, a difference of 3%, or just the reverse of the above statement. The statement that complexity of ores increases the inaccuracy of the fire assay is not very satisfying—it is rather indefinite and too general. What we want to know is what are the usual ingredients in the ores that influence the fire assay? Can't an ore be complex and yet the fire assay be fairly correct? In the complex ores containing arsenic, antimony, bismuth, copper and iron, fire assay is very apt to give results above those of chemical method. His table of comparative tests of nine samples is too one-sided to be convincing. It proves nothing; merely shows that the volumetric method on these samples showed higher results than the fire test.

It is not unusual, nor a fact, that the ores which need the most consideration get the least. It is to the interest, and has been the policy, of the smelters to make prices which will keep as many mines producing as possible, and any discrimination in prices has favored the low-grade producer.

In many cases of ores carrying under 5% lead, the lead is paid for as iron.

I am not prepared to say, as a fact, that the loss of lead in a blast furnace should average up with a loss by fire assay. Every one knows the conditions of bandling ore in a furnace are quite different from that of an assay test, and that in the practical working of furnaces lead goes into fumes, into slag and into matte, and, in the latter, being subject to a second loss by roasting and resmelting; but I do know a smelter does not sell as much lead as it purchases.

Mr. Warwick gets away from the scientific side of the question entirely when he goes to talk about what the smelters pay for lead and what they sell it for. He figures the smelters' schedule for the lead contents, and leaves the story of the balance of the schedule untold.

It is the custom in Colorado to buy lead in ores at

so much a per cent, and if the smelter has a margin in the lead it is otherwise with the balance of the price.

There is no question in my mind that the smelters desire, and would advocate, the chemical method, but I am not so sure that Alexander's method is the best—I am told that it is very unreliable in ores carrying lime.

If the Society cares to investigate this subject further, I would approve of Mr. Warwick's suggestion to appoint a committee to investigate the subject.

Mining in Peru, South America.*

Written for the MINING AND SCIENTIFIC PRESS by
M. J. LIDSTONE, M. E.

The Chuquitambo gold mine, owned by the Nimrod Syndicate, Ltd., of London, is situated in the district of Junin, over 200 miles from Callao, on the Atlantic slope of the Andes and the headwaters of the Amazon. It is a mine noted in the history of Peruvian gold mining, and is supposed to have been worked by the Incas many years before the conquest of the country by Pizarro.

It is known to have produced several million dollars before the present owners obtained possession of it.

The location is ideal for mining purposes, the expense of operating being nominal, probably not exceeding \$1 a ton.

The town of La Quinua is just below the mine and 9 miles east of the Cerro de Pasco copper mine, owned by the J. B. Haggin Co. of New York City. It lies at an altitude of 11,000 feet above sea level. The chief occupation of the natives is agriculture, the soil being fertile and well adapted to the raising of good crops of potatoes, their staple food. The climate is salubrious, being similar to northern and central California.

Lime is the principal geological formation of the country.

The Chuquitambo has very large deposits of conglomerate and sedimentary ore, easily worked by tunnels and open cuts. It promises to be a large and successful property, having several separate deposits. The ore is carried to the mill by inclined gravity tramways.

A modern 40-stamp mill has recently been erected on the property by the Union Iron Works of San Francisco, Cal., which will be increased in the near future to 100 stamps. There is an abundance of water power, conveyed to the plant by a ditch and pipe line, which is utilized for running the mill. The ditch has a capacity of about 500 H. P.

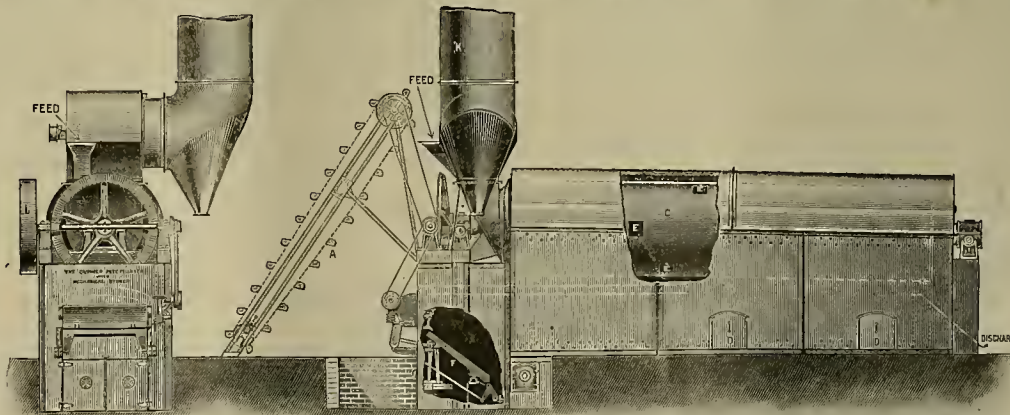
The laborers are principally natives, who work for very small wages—from 40 cents to \$1 a day, gold.

Frank Merricks, the manager, has gone to London for a few months, and Ernest Lascelles is acting manager in his absence.

*See illustrations on front page.

The Cummer Dryer.

The accompanying engraving illustrates the Cummer self-contained dryer, which consists of a revolving cylinder incased in a steel casing. A mechanical stoker for burning slack bituminous coal is shown in the cut, but the furnace can be fitted for burning



The Cummer Dryer.

any kind of fuel. An elevator is shown for elevating the material to be dried by the dryer, but where sticky slimes are to be dried the Cummer bandling system is used. This system so handles the material that it is impossible for it to stick in the dryer.

The Cummer dust collector is also furnished with the self-contained dryer, and no dust is lost, which is a very important factor. The Revenue Tunnel Co., Ouray, Colo.; Silver King Mining Co., Park City, Utah; Smuggler Union Mining Co., Telluride, Colo., are all drying concentrates and slimes by the Cummer process. The manufacturers, The F. D. Cummer & Son Co. of Cleveland, Ohio, will furnish particulars.

Geology of the District West of Redding, Cal.

Written for the MINING AND SCIENTIFIC PRESS by
CHAS. J. O'BRIEN, M. E.

Four miles west of Redding, extending almost due north and south, a dike of andesite comes up through the ancient porphyry which forms the underlying country rock of the district. The overflow was quite extensive, and the trend of the dike is clearly defined throughout its course by outcrops of schist, due to the metamorphism of the country rock along the plane of contact.

Both the original country rock and the overflow, as well as the dike itself, are much altered for a considerable depth. In both cases the ferro-magnesian silicates are changed to chlorite, and, in the case of the porphyry, secondary calcite has formed. The andesite is considerably richer in iron than the porphyry which it penetrates and overlies, and both are rich in alumina and poor in magnesia, which is manifest in the schists and other alteration products of these rocks. These schists, frequently called talc, are properly chlorite, schist and phyllite, and range in color from almost colorless translucent through light and dark green to black. There is a slight difference between the schists produced in these two rocks, that in the andesite being somewhat crystalline, more blocky and opaque, than the schists in the porphyry.

Those who would anticipate the character of the ores to be found in a given formation in this district, if any, should learn to make the foregoing distinctions, as the mode of occurrence in the two formations here considered is widely different. In the first place, it may safely be said that all values occur in connection with veins in the schists. There are numbers of gash veins in the andesite, but, as far as my knowledge goes, these are invariably barren.

At the Mt. Pleasant mine, on the Shasta road, development work has been on the foot wall of the dike, the original porphyry forming the other wall. Here the quartz bodies, lenticular in form, are pretty thoroughly mineralized throughout their whole extent, the ore being pyrite, with traces of chalcopyrite and a little free gold. At the Sugar Loaf, 3 miles south of the Mt. Pleasant, development on the hanging wall of the dike has brought to light free gold in pockets, and some tellurium (nagayagite). The pyrite here found occurs in small cubes, thinly sprinkled along the interstices between quartz and schist, and may be neglected for values. This seems to be the general character of the ore wherever it has been found in the andesite.

Of what may be contained in the original porphyry little can be said in a general way. Erosion has exposed only small areas here and there, and but a few veins have been uncovered. What may be considered a promising silver prospect has been opened a short distance east of the main contact. The ore is gray copper, and assays taken from the dump show values ranging from 17 to 500 ounces of silver to the ton. Copper, lead and antimony are also constituents. The claim is not being worked at present.

The Sugar Loaf mine has two old veins in the porphyry, which intersect the contact. These ledges are large, but low grade, so far as a depth of 10 or 15 feet has demonstrated. The ore is marcasite.

An interesting feature in connection with the veins along the contact is that at times considerable lime is encountered in the gangue. It is of the variety called aragonite, which is presumed to be deposited from hot solutions. It is often found crystallized and

Hints on Rubber Belting.

Written for the MINING AND SCIENTIFIC PRESS by W. H. KRITZER.

In selecting belts, secure them of sufficient width, so they will run without slipping and still be moderately slack.

The width of belt needed depends on the tension and speed of the belt, also arc of contact on smaller pulley.

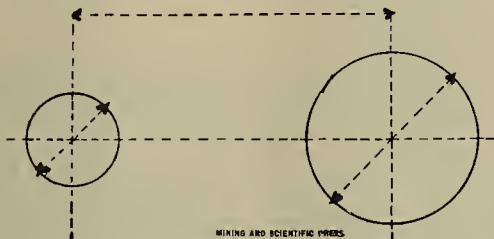


FIG. 1.

vide for stretch, cut it shorter than the actual measurement around pulleys taken with a steel tape measure drawn tight.

To allow for stretching in a new belt of 3, 4 or 5 ply, cut it $\frac{5}{32}$ inch per foot shorter, for 6, 7 or 8

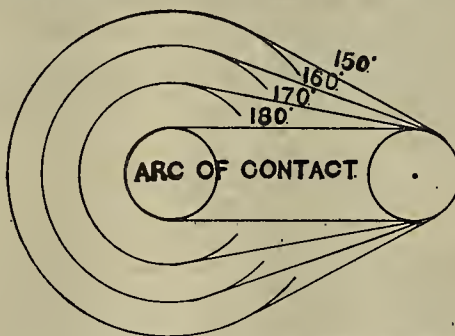


FIG. 2.

of belt, so that each hole in the second row centers between the nearest two holes in the first row.

For lacing belts rawhide lace leather is better than any other kind and $\frac{1}{4}$ inch is the proper size for belts up to 3 inches in width, $\frac{3}{8}$ inch for a 3 to 12 inch width of belt and $\frac{1}{2}$ to $\frac{3}{4}$ inch for main belts from 12 inches up. The size of holes and distance between them should be as per following table:

Width of belts.	Size of hole.	Distance of first holes from ends of belt.	Distance of first hole from edge of belt.	Space between holes.
3 in.....	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	$\frac{3}{8}$ in.	$\frac{3}{4}$ in.
3 to 6 in....	$\frac{3}{16}$ in.	$\frac{3}{4}$ in.	$\frac{3}{8}$ in.	1 to $1\frac{1}{4}$ in.
6 to 12 in...	$\frac{1}{4}$ in.	1 in.	$\frac{1}{2}$ in.	$1\frac{1}{2}$ in.
12 to 18 in..	$\frac{5}{16}$ in.	$1\frac{1}{2}$ in.	1 in.	$1\frac{1}{2}$ in.

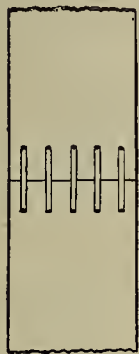


FIG. 4.



FIG. 5.

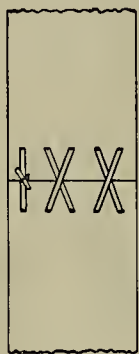


FIG. 6.

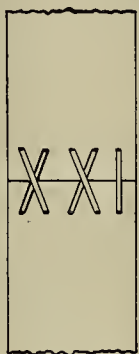


FIG. 7.



FIG. 8.



FIG. 9.



FIG. 10.

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FIG. 11.



FIG. 12.



FIG. 13.



FIG. 14.

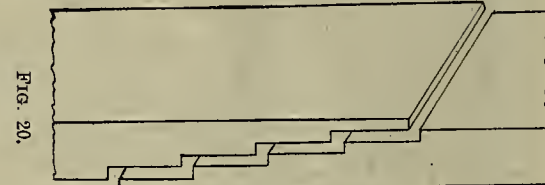


FIG. 20.

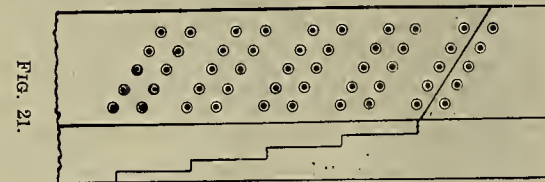


FIG. 21.

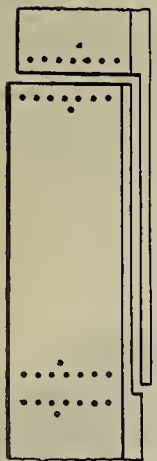


FIG. 15.



FIG. 16.



FIG. 17.

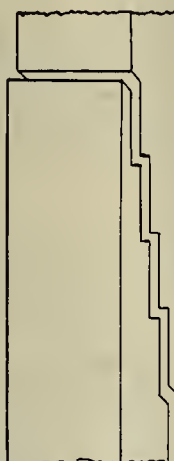


FIG. 18.

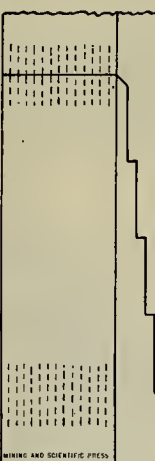


FIG. 19.

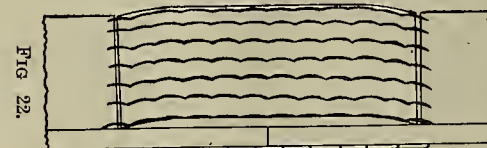


FIG. 22.



FIG. 23.

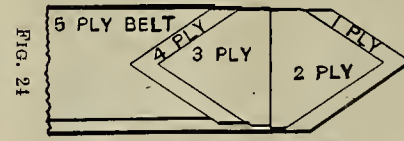


FIG. 24.

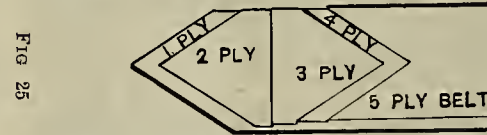


FIG. 25.

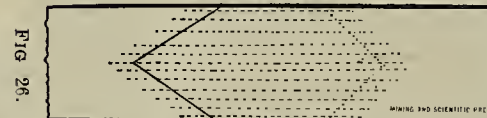


FIG. 26.

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Fig. 1—Sketch showing arc of contact of belt with pulley.
Fig. 2—Sketch showing manner of measuring up for length of belt needed.
Fig. 3—Sketch showing butt joints—laced. Reverse side.
Fig. 4—Sketch showing butt joints—laced. Pulley side.
Fig. 5—Sketch showing butt joints—laced. Reverse side.
Fig. 6—Sketch showing butt joints—laced. Pulley side.
Fig. 7—Sketch showing butt joints—laced. Reverse side.
Fig. 8—Sketch showing butt joints—laced. Pulley side.
Fig. 9—Sketch showing butt joints—laced. Reverse side.
Fig. 10—Sketch showing butt joints—laced. Pulley side.
Fig. 11—Sketch showing butt joints—laced. Reverse side.
Fig. 12—Sketch showing butt joints—laced. Pulley side.
Fig. 13—Sketch showing butt joints—laced. Reverse side.

Fig. 14—Sketch showing butt joints—laced. Reverse side.
Fig. 15—Square scarf joint—laced (suitable for wide belts). Reverse side.
Fig. 16—Square scarf joint—laced. Reverse side.
Fig. 17—Square scarf joint—laced. Reverse side.
Fig. 18—Bevel scarf joint before joining.
Fig. 19—Bevel scarf joint after joining.
Fig. 20—Diagonal scarf joint before joining.
Fig. 21—Diagonal scarf joint after joining.
Fig. 22—Back splice with extra piece of leather over joint.
Fig. 23—Back splice, side or edge view.
Fig. 24—Diamond splice before joining one end.
Fig. 25—Diamond splice before joining other end.
Fig. 26—Diamond splice before joining.

Tight belts mean additional friction on bearings and a waste of power.

Wide, heavy belts required to perform unusually severe work should be made endless.

Seam side of belts should not be run next to pulleys.

Speed of belts should not exceed 5000 feet per minute, and less than 4000 is preferable.

In adjusting a new rubber belt, in order to pro-

vide for stretch, cut it shorter than the actual measurement around pulleys taken with a steel tape measure drawn tight.

A 4-ply belt for transmitting power is equal to a single leather belt. A 6-ply is equal to a double leather belt, and the adhesion is from 40% to 80% greater under like conditions.

Cut ends of belts squarely across and punch two rows of holes in each end, the second row to be the same distance from the first as that is from the end

Lace from center hole in first row to opposite hole in second row, in such manner that the lace shall be straight and smooth on the pulley side and crossed on back of belt, as shown in the engraving.

Always run so that the point of lap on inside runs against the pulley. This protects the outside lap, which is most liable to open up when run point against the atmospheric pressure.

If a belt slips, moisten it very lightly on the pulley

side with castor or boiled linseed oil. Never allow animal and mineral oils, grease, resin or soap to come in contact with belts.

Do not use a vertical belt if you can possibly avoid it.

Allow no foreign objects to come in contact with belts, and, if the surface is peeled or rubbed off, apply the following mixture and let dry before running: Equal parts of red lead, black lead, French yellow and litharge, mix with boiled linseed oil and add enough Japan to make it dry quickly.

Always use a pulley as large as conditions permit, as a belt of many plies will go to pieces more quickly if run over a small pulley; then the power transmitted is largely dependent on the area of contact.

Wide belts should always be put on pulleys with

with the maker as to its being laced, riveted, sewed or wired—simply a matter of choice, as one style may be more preferable than another under the existing circumstances.

Regeneration of Cyanide Solutions After Zinc Precipitation.*

Written by ANDREW F. CROSSE.

A great deal has been said in past years at our meetings concerning the chemistry of the cyanide process, but I am of the opinion that the value of correct chemical investigation and conduct of the whole process has never been estimated at its full value. At present, speaking broadly, the whole process is controlled by estimating the amount of potassium cyanide in solution, and adding the amount required to bring it up to a certain required standard of strength. An excess of alkali is generally present, and the excess has never been accurately determined. It has been stated by various speakers that the cyanide process has attained to a state of perfection, and we have been informed that, in the future, we need not look to many interesting discussions in connection therewith. I am of the contrary opinion, and I am sure that there are a great many improvements possible, even in connection with our own comparatively simple treatment on the Rand. It is needless to say that the more complex ores in other parts of the country will give rise to complications which will need much research to overcome. I doubt whether any method has yet been published for the accurate determination of the "free" potassium cyanide in a working solution, containing all the impurities found there, neither am I aware of any method that will give a satisfactory determination of the protective alkali present in such solutions. I have published a method for the determination of protective alkali, but, on further investigation, I must candidly confess that I am by no means satisfied with the results obtained.

I have mentioned these facts merely to prove to you how much remains to be done in this particular field.

Many of you will consider these investigations of purely scientific interest. I do not think so, for I hold that the more we find out as to the chemical changes which take place in our solutions the more likely we are to arrive at the most economic and profitable use of the process.

Some four or five years ago it occurred to me, and I believe it may have occurred to many others, that the double cyanide of zinc and potassium, $K_2Zn(CN)_4$, could be regenerated by precipitating the zinc as a sulphide and recovering the cyanogen, combined with the zinc, in the form of an alkaline cyanide according to the equation $K_2Zn(CN)_4 + Na_2S = ZnS + 2KCN + 2NaOH$. I made a great many experiments on these lines, and found that in the cold the precipitation was incomplete. I therefore heated my cyanide solution to a temperature of approximately 65° C., and obtained practically complete precipitation.

The quantity of sodium sulphide required is determined by carefully estimating the zinc present in the solution, and if the value of the sulphide is known, all that is required is to add sufficient sulphide to precipitate 95% of the zinc.

The precipitate separates out rapidly, the coagulation of the zinc precipitate being accelerated by the addition of a little milk of lime.

The precipitate occupies but a very small proportion of the total bulk of the solution, and the clear supernatant liquid can be decanted with the greatest ease.

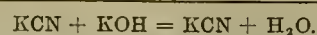
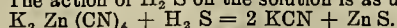
It has been stated that zinc sulphide is soluble in potassium cyanide. This is scientifically correct, but the amount left in solution after using the above process is so small, and so easily got rid of by atmospheric oxidation, that it has no practical value.

The complete scientific explanation of many reactions which we find on investigating cyanogen and its compounds in diluted solution, can be fully explained by the aid of the most modern theories of dissociation; our old-fashioned chemical equations are quite incapable of illustrating the reactions which take place in diluted solutions.

The continuous use of an alkaline sulphide would be open to some objection, owing to the slight but continual increase of caustic alkali, formed by the decomposition of potassium zincate (K_2ZnO_2).

$K_2ZnO_2 + Na_2S + 2H_2O = 2KOH + 2NaOH + ZnS$.

In order to prevent this I collect the precipitated sulphide in a filter press and use it to generate H_2S . The action of H_2S on the solution is as under:



The whole process has to be guided by simple chemical analysis, thereby maintaining the free caustic alkali in solution at any fixed percentage.

The process of regenerating the sulphide used also enables me to recover any small quantity of silver sulphide precipitated with the zinc. This quantity, however, would not be very large, as the regeneration of the cyanide working solution would only take place after the solution had passed through the extractor box. Sodium sulphide has no action on the auro-potassic cyanide $KAu(CN)_2$.

I am well aware that a solution of pure $K_2Zn(CN)_4$ will dissolve gold very readily, but, in my opinion, this is due solely to the cyanogen in the "KCN" molecule; the complex molecule $K_2Zn(CN)_4$, being partly dissociated in dilute solution into KCN and $Zn(CN)_2$. The latter molecule, being in a meta-ionic state, cannot have any value as a gold solvent.

I had plenty of time for making experiments when I first returned to Johannesburg during the war. Mr. Macfarlane, the general manager of the City & Suburban G. M. Co., was kind enough to supply me with plenty of solution, and also a large quantity of spitzluten concentrates. The solution contained no "free" KCN, all the cyanide being in the form of the zinc potassium salt, $K_2Zn(CN)_4$. I obtained a very satisfactory extraction with the solution, but the subsequent precipitation was most unsatisfactory; under definite conditions the extraction being 83.4%, the precipitation only 36%, which would give a total extraction of 30%.

I regenerated the solution as above, and obtained, under identical conditions, an extraction of 91.7% on a precipitation of 96.2%; total, 88.2%.

Of course, no cyanide manager would have used a solution in such a condition; he would have improved it by adding cyanide. I arrived at an even more satisfactory state of things without the addition of any cyanide. Within the last month I have confirmed my laboratory results by treating solution by the ton, pumped direct from the cyanide sumps.

The general results of my investigations in connection with working cyanide solutions has led me to believe that we can aim at obtaining a working solution of normal constitution and strength, and regulate its composition from time to time so as to obtain the best results, both as regards solution and precipitation of the gold, with a minimum expenditure of cyanide. I will not say "cyanide of potassium," as in the near future we shall probably use the cheaper and more common element, sodium, to form an alkaline cyanide.

The method used in my laboratory for the determination of zinc in working cyanide solutions is a modification of that described on page 338 of the last edition of Mohr's Volumetric Analysis.

The solutions required are:

$\frac{N}{10}$ Iodine.

$\frac{N}{10}$ Hyposulphite.

5% Sodium Sulphide.

Method: 100 c.c. working solution is heated to about 70° C. and an excess of sodium sulphide added. The preparation is allowed to settle, filtered off and well washed on the filter with hot water, the washing is continued until the wash water shows no trace of sulphide, the filter paper is then transferred to a small 150 c.c. flask.

The flask is filled with a rubber cork having two holes bored in it, through one passes a drip funnel with tap, and through the other a short piece of glass tube, terminating in a small length of rubber tubing,

a pinch cock is attached to the latter. Sufficient $\frac{N}{10}$ iodine is then run into the flask to leave an excess of not more than 5 c.c. (30—35 c.c. $\frac{N}{10}$ I. is usually sufficient).

The cork is replaced and about 100 c.c. very dilute hydrochloric acid placed in the funnel. The tap is opened and on pressing the pinch cock air escapes and the dilute acid takes its place. The taps are then closed and the whole apparatus shaken to thoroughly break up the filter paper. After a few minutes standing the contents of the flask are

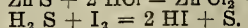
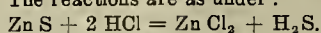
titrated with $\frac{N}{10}$ thiosulphate and the excess of iodine determined.

If X = No. of c.c. $\frac{N}{10}$ Iodine taken

Y = No. of c.c. $\frac{N}{10}$ $Na_2S_2O_3$.

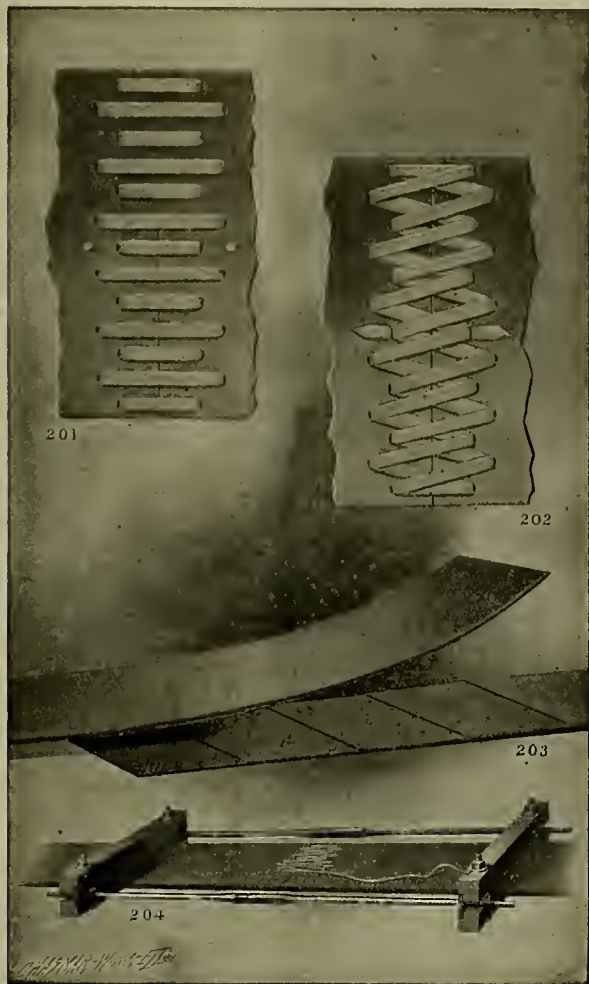
(X - Y) .00325 = grams zinc per cent.

The reactions are as under:



The method is rapid of execution and capable of great accuracy.

In regard to the determination of protective alkali, my assistant, G. W. Williams, and myself have spent a great deal of time in investigating various methods of the determination of protective alkali in working cyanide solution, and we intend, in the near future, to read a paper on this subject. I do not by any



Method of Clamping and Lacing a Belt.

clamps, as illustrated in accompanying engraving, by means of which they may be drawn tightly and laced properly without possibility of injury.

The engraving is from the catalogue of the New York Belting & Packing Co., New York City.

"Running on" a belt after it has been laced is liable to injure or break it. Have the face of pulleys wider than the width of belt used, especially flange pulleys. When a tightening pulley is needed it should be placed near the smaller pulley and applied to slack side of belt. Covering pulleys increases their efficiency from 30% to 50%.

If a belt is to be shifted from one pulley to another, rollers should be placed on the shipper on each side of the belt in a diagonal position, bringing the upper ends of the rollers as near together as possible to clear the belt, and diverging from each other at the lower end as far as may be.

To find length of belt needed, multiply sum of diameters of pulleys by 1.57 and add twice the distance between shaft centers; or add the diameters of the two pulleys together, divide the result by 2, and multiply the quotient by 3.1416, then add the product to twice the distance between the centers of the shafts and you have the length required. The following table shows the horse power transmitted per inch of width of belt for each 600 feet of speed per minute:

Arc of contact with pulley.	Ply.				
	4	5	6	7	8
150° .....	.91	1.09	1.27	1.45	1.64
160° .....	.94	1.12	1.31	1.50	1.69
170° .....	.97	1.16	1.35	1.55	1.74
180°	1.00	1.20	1.40	1.60	1.80

After any scarf joint is cemented, it is optional

*Journal Chemical Society, South Africa.

means consider our work as final, and I am of the opinion that the matter requires further investigation. Anyhow, the paper will no doubt give rise to some discussion.

A Man Elevator.

Written for the MINING AND SCIENTIFIC PRESS by
S. I. HALLETT, E. M.

One of the most tedious things encountered in a gravity mill of any character located upon a hillside is the question of getting from one floor to another.

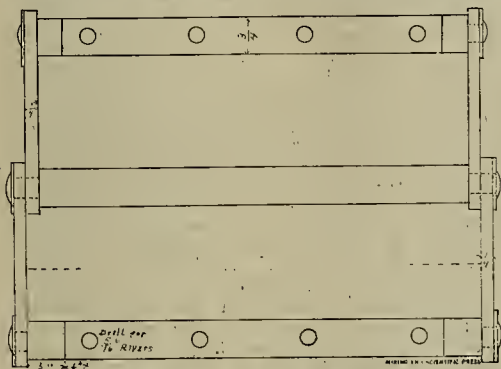


Fig. 1—Front Elevation Hand Hold.

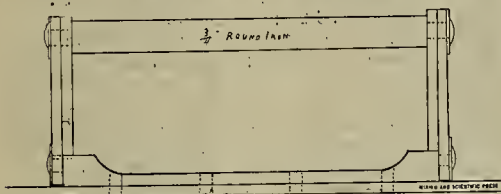


Fig. 2—Plan Hand Hold.

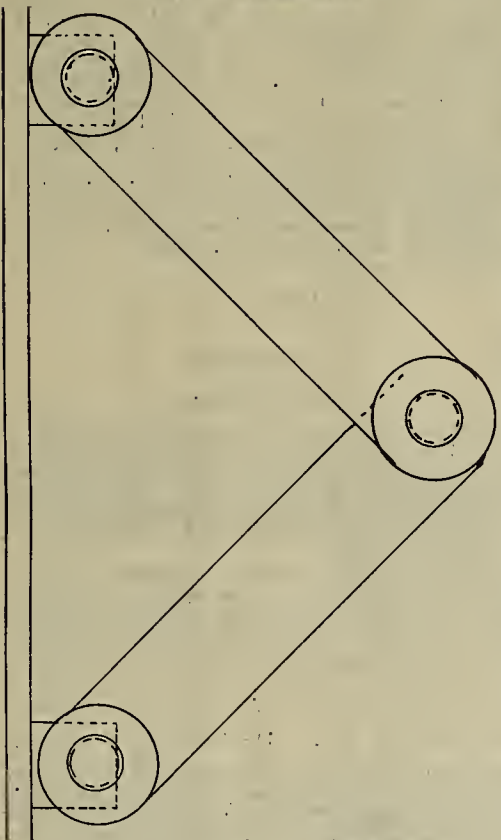


Fig. 3—Side Elevation Hand Hold.

The incessant climbing of stairs wears one out, and it is very often the fact that the superintendent of the mill does not get around as much as he should from sheer weariness.

The accompanying engraving is of a man elevator that has been in use at the Silver Lake mill for the past year and a half, that is an immense saver of time and muscular energy.

As may be seen by the illustration, it is merely a continuous belt running at about 75 feet per minute, with hand-holds placed at convenient distances, so that a man may step upon one rest, taking hold of another, and travel up one side and down the other.

They are an extraordinary convenience in a tall mill and, in a general way, we have never had an accident with ours. Occasionally we have had a man get absent-minded and go over the top, where a platform is placed handy for just such gymnastics, but I have yet to learn of a case where the same man went over a second time. They are inexpensive but extraordinarily convenient.

DATA FOR MAN ELEVATOR. — Upper pulley, 12 inches diameter, 14 inches face flanged, $2\frac{1}{8}$ inches bore.

Lower pulley, 12 inches diameter, 14 inches face flanged, $2\frac{3}{16}$ inches bore.

Belt, 12 inches, four-ply, rubber.

Foot rests, placed 5 feet 10 inches apart, and are



Man Lift in Silver Lake Mill, Silverton, Colo.

fastened to the belt with elevator bolts.

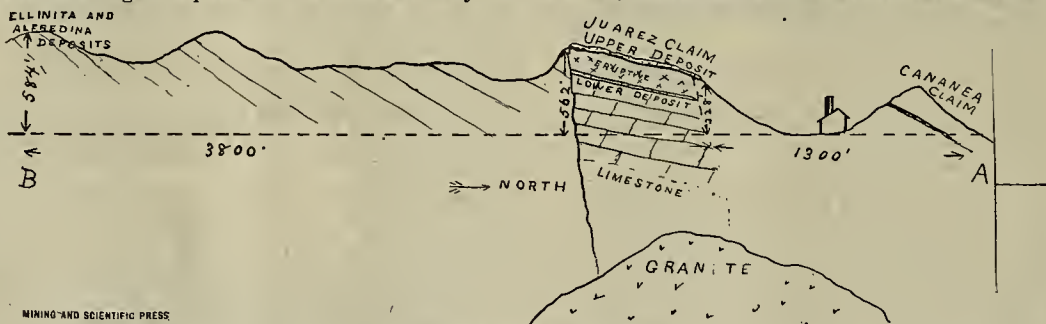
Idler pulleys are used as guides on each floor, through which the belt passes.

Speed of belt, 75 feet per minute.

Gold in Georgia.

"Gold and pyrite deposits of the Dahlonega district," by Edwin C. Eckel, in Bulletin 213 of the U. S. Geological Survey, discusses briefly the general geology of the Dahlonega district (Lumpkin county), the gold ores and ore deposits, the relations of the gold ore deposits, and their age. The upper weathered zone of gold deposits can be worked at very low

ejected the copper and eruptives. The copper deposits lie in two sheets, each about 12 feet in thickness, one immediately on top of the limestone, the other about 40 feet above it, with an intervening sheet of eruptive rock. From these sheets, which dip at an angle of 20° from the horizon toward the northeast, there are ramifications of copper deposits and veins in the limestone, but the main deposits are the two sheets described. Besides the volcanic, there have been seismic disturbances, as shown by several well-defined faults between A and B (see sketch), and it is not therefore impossible that at one time the present isolated deposits on the Cananea, Juarez and Ellinita claims were connected.



Geology of Cananea, Mexico.

cost by hydraulic mining; the deeper gold ore requires expensive processes, and chlorination has not been found entirely satisfactory.

The most interesting development in the Dahlonega district during 1902 was the opening of a large high-grade body of pyrite near the town, the property of the Chestatee Pyrites Co., about 6 miles northeast of Dahlonega, on the south side of Chestatee river. This deposit outcrops about 2000 feet along the surface of the ground. It appears to be not less than 20 feet in thickness and has been followed down on the dip for a distance of about 150 feet. The average of the analyses shows about 44% sulphur, 40% iron, and 3% copper.

The ores in the first two claims are chiefly carbonates, and average 5% copper, 4 ounces silver and from a trace to \$1 gold per ton; the gangue is siliceous, analyses yielding from 50% to 65% silica, 5% to 10% lime, 10% to 14% iron. The Ellinita ores run higher, but are much less in quantity, at least as far as developed. Mr. Mitchell, the general manager of the Cananea mines, has since informed me that no attempt had been made to smelt these ores, since my visit to the property. Whether any further development of the ore bodies had been attempted I am not sure. The necks or pipes from which these ores were ejected are probably located in the vicinity of what at the time of my visit was called Camp

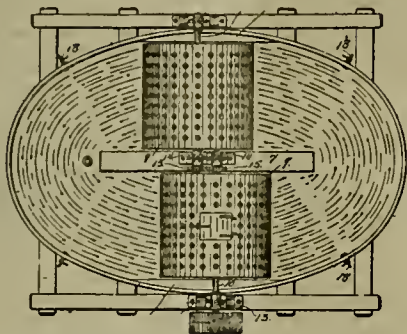
Mitchell, and is now the town of Cananea, for it is there that the larger, richer and baser deposits of copper exist. There, too, however, at that time, the ore bodies were practically undeveloped. Nevertheless, there were open cuts showing ore 10 feet thick, and assaying 10% copper.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 19, 1903.

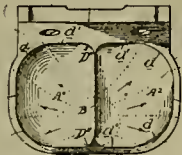
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PRECIPITATING APPARATUS—No. 728,126; P. W. McCaffrey, Denver, Colo.



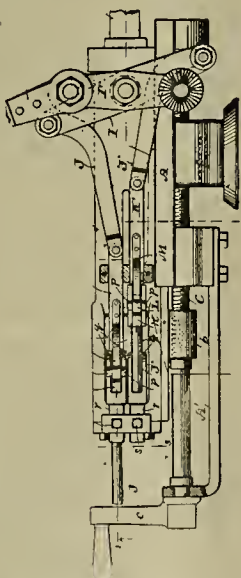
In precipitating apparatus, combination of tank for holding solution, tank being provided with central partition, around extremities of which liquid is free to circulate, cylinders mounted to rotate on opposite sides of partition and partially immersed in solution, cylinders being perforated and containing scrap metal, and means for rotating cylinders in reverse directions whereby liquid is set in motion in circular current.

WATER WHEEL BUCKET—No. 728,230; G. J. Henry, Jr., San Francisco, Cal.



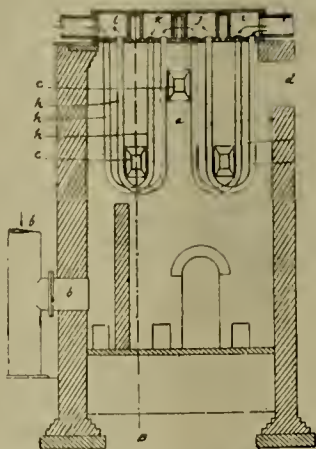
Water wheel bucket of character described, consisting of two cavities having cylindrical central surfaces each having unbroken front and rear wall, front and rear walls being joined to side walls and bottoms of cavities by gradually curved spreading surfaces thereby providing large curved outer corners and unbroken interior surfaces to each of bucket cavities, to form regular discharge lines for water along bucket surfaces.

HAND ROCK DRILL—No. 728,314; V. Y. Smith, Globe, Ariz.



Combination of slotted casing, drill shank having rear head within slotted portion of casing, slide bars, spring controlled sliding tooth carried by each slide bar and which for a time in rearward movement abuts drill shank head, whereby shank is retracted against spring resistance in casing, anti-friction rollers carried by teeth laterally of same, inclines arranged in rear paths of rollers, and lever and link mechanism for actuating slide bars.

PIPE STOVE FOR HEATING THE BLAST FOR BLAST FURNACES—No. 728,377; E. P. Davis, Ilkeston, England.



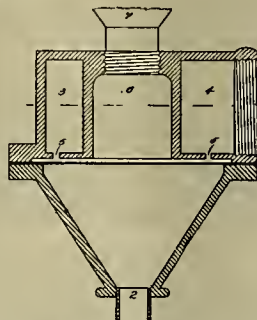
Pipe stove for heating blast for blast furnaces, provided with U shaped iron or steel pipes through which blast passes, pipes depending in stove from blast boxes or chambers at top of same.

CONCENTRATING APPARATUS—No. 728,331; A. Ten Winkel, Denver, Colo.



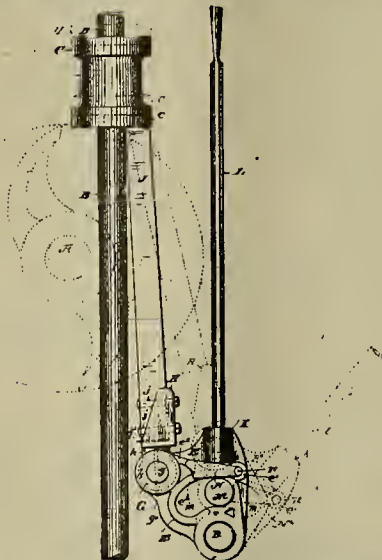
Combination with concentrating table, of mesh fabric provided with projections extending above and below same, but made fast thereto, lower projections resting on surface of table and forming support for fabric, leaving space below for fine material passing through fabric.

HYDRAULIC CLASSIFIER—No. 728,487; C. W. Merrill, Alameda, Cal.



Hydraulic classifier consisting of closed downwardly convergent receiver, centrally located supply opening at top, water chamber surrounding opening and having side supply opening and bottom slotted to form continuous channel opening into receiver near inner periphery of receiver, and source of supply connecting with opening at top of receiver.

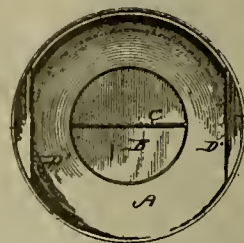
HANGING UP OR THROWING OUT OF OPERATION THE STAMPS OF STAMP MILLS—No. 728,631; J. J. R. Smythe, Johannesburg, Transvaal, South Africa.



Means for hanging up stamps of stamp mills comprising angular plate or sector mounted on jack bar, so that it may rotate freely thereon, socket pivotally attached thereto in which supporting rod or finger is fixed and socket or hole for operating lever, and

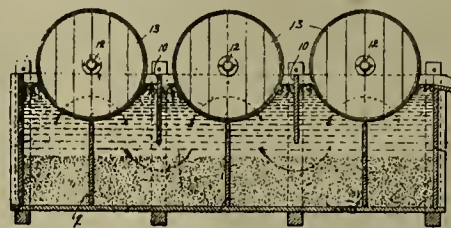
catch pivoted to sector, arranged so that when sector is rotated on jack bar it lifts finger to elevate and retain tappet clear of cam.

ORE WASHING PAN—No. 728,677; J. A. Creasy, Kansas City, Mo.



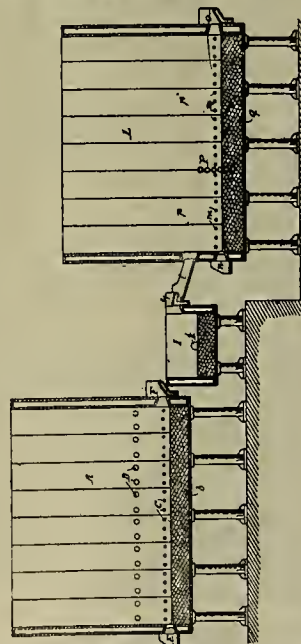
Ore washing pan having inwardly projecting sector-shaped flanges arranged on opposite edges of pan, and riffle bar running around one side of pan from one flange to other.

MEANS FOR PRECIPITATING DISSOLVED METALS—No. 728,746; P. W. McCaffrey, Denver, Colo.



In copper precipitating apparatus, combination of tank adapted to hold solution, upwardly projecting partitions located in tank, depending partitions, located intermediate upright partitions and whose lower extremities terminate below upper extremities of upwardly projecting partitions, and perforated cylinders containing scrap iron, cylinders being mounted to rotate in tank whereby they are partially immersed in solution, cylinders being located directly above upper extremities of upwardly projecting partitions and close to extremities, tank being constructed to receive solution one end and discharge by overflow at opposite end, discharge being above lowest part of cylinders, whereby solution caused to pass through scrap iron in all cylinders before leaving tank.

METHOD OF MATTE OR PYRITIC SMELTING—No. 728,701; O. S. Garretson, Buffalo, N. Y.



Method matte or pyritic smelting consist in subjecting molten matte to converting or bessemerizing blast underneath column material which contains flux, removing slag and subjecting slag to action of blast underneath column of sulphur-bearing material.

GOLD EXTRACTION PROCESS—No. 728,397; T. B. Joseph, Salt Lake City, Utah.

Process of extracting gold and silver from ore containing same when in suitable condition, consists in subjecting ore to leaching action of solution of water, cyanide of potassium, hydrate of calcium, peroxide of barium and carbonic acid gas, gas being forced into leaching solution simultaneously with compressed air.

PROCESS OF RECOVERING BROMINE—No. 728,566; C. D. Grove, Colorado Springs, Colo.

Treatment of ore by bromine and subsequent recovery of bromine, process of reducing bromates formed in alkali solutions to bromides, consists adding to bromates hydrogen sulphide.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

It is reported a German company has acquired a group of claims on a ledge of tin-bearing ore on Cape Prince of Wales. A smelting plant is on its way to Cape York.

ARIZONA.

COCHISE COUNTY.

A strike is reported 4 miles east of Pearce on a group of claims being worked by J. C. Mortelle, W. Lane and F. Taylor. The ore is said to carry sylvanite. It is near the Commonwealth mine.

The Atlas Ex. & M. Co. has bought the C. Fanning group of fifteen claims aggregating 300 acres of copper ground adjoining the Lake Portage & Bisbee group, 3 miles from Bisbee. The Lake Portage Co. have a diamond drill at work prospecting the ground.

The Princeton M. & S. Co. at the head of Ramsey canyon, 24 miles southwest of Bisbee, has resumed, says President H. Hamburg at Bisbee. The work consists of prospecting shafts, a tunnel 200 feet long and a winze 20 feet deep at the face of the tunnel where the ore was found. Average assays show 10% copper and six ounces silver.

A strike of free milling gold ore is reported made in the Golden Era mine, which joins the Easter Sunday mine, in Warren district, near Bisbee.

The W. K. Taylor group of three claims in Warren district, near Bisbee, has been sold to T. Hogan and G. M. Staltz for \$12,000. The group is near the Golden Era.

GRAHAM COUNTY.

The mill of the Detroit C. Co., near Morenci, is handling 600 tons of ore daily, making 100 tons of concentrates, and using 125 gallons of clear water per minute, in addition to the water used over again, says the Florence Blade. The company has four furnaces in operation and are building a fifth, to have a capacity of 600 tons daily. The water supply is pumped from Eagle river.

MARICOPA COUNTY.

The Ford group of copper mines has been sold for \$45,000 to the La Gloria M. Co. of Philadelphia, Pa., men, H. A. Bomberger president. The group consists of five claims in north end of White Tank mountains, 35 miles northwest of Phoenix and southeast of the Vulture mine. It is 8 miles from Beardsley on the S. P., & P. Railroad and near the Agua Fria river. The ores carry values in copper and gold.

President G. Beebe, San Francisco, Cal., of the Cieneguita C. Co. of Phoenix, says they have drawn up plans for a 300-ton matte smelter with Bessemer converters and expect to have the plant ready for operations this fall.

MOHAVE COUNTY.

(Special Correspondence).—T. Thornton, developing his Homestake mine, near Chloride, reports opening up a ledge of gold-silver ore at a depth of 78 feet from the surface.

The Elkhart mine and mill resumed last week, after a temporary shutdown to replace some of the machinery in the mill.

Fire destroyed the shaft house at the Empire mine last week and damaged the pumping plant, which was furnishing water for the Elkhart mine and mill, 1½ mile below. Repairs are being made.

The Minnesota mine and mill are working a few men, says Manager E. T. Loy. S. Smith is developing his gold discovery on the Emerson mine.

Schemmelpennig & Dryden are developing their lease on the Altura mine and have put on more men. They are shipping ore.

Developing and prospecting continue in the new gold district 8 miles west of Chloride, around the Dempsey-O'Dea mine.

At Mineral Park ore is being taken out of the shaft of the Queen Bee, some of which assays high in silver. Hoisting machinery has been put in.

The Keystone mill is to be rebuilt and run on ore from the Keystone mine.

At Gold Road a test of the machinery of the 300-ton milling plant of the Gold Road mine was made last week and will be in full operation by June 1.

The Leland Co., near Acme, expects to have its 120-ton plant in operation next week on its own ore. At the Leland, as at the Gold Road, there is a large tonnage of ore on the dump.

Chloride, May 25.

H. L. Pickett of Salt Lake City, Utah, manager of the Savanic copper mine, south of the Utah line, says he will build a smelter at the mine and men will be put to work June 1st.

C. D. Pickering, superintendent of the

Yucca Cyanide M. & M. Co., near Kingman, says additional machinery will be put in their mill, which they expect to have in operation next month. It is the intention to concentrate the ores and ship the product to the smelter. The main shaft is down 400 feet and drifts are being driven from that point. The values are chiefly in gold.

PIMA COUNTY.

The Tucson S. & R. Co. will build a smelter on the Copper King group of mines, 14 miles southwest of Tucson, says Manager W. W. Robinson. There are twenty-four claims in the group.

The Silver Bell copper mines are reported sold last week to the Imperial C. Co. for \$1,000,000. The sale includes sixty claims and two sixty-ton-furnace plants. The mines are 40 miles west of Tucson and 20 miles south of Red Rock, on the Southern Pacific.

PINAL COUNTY.

(Special Correspondence).—The Pinal Paraffine Oil Co., near Kelvin, have their well down 1230 feet.

Kelvin, May 25.

SANTA CRUZ COUNTY.

J. T. Brickwood has bought a half interest from T. O'Mara in the Old Soldier and Young Volunteer mines in the Patagonia mountains, near Nogales, and near the Bluenose and Mowry mines.

YAVAPAI COUNTY.

(Special Correspondence).—The Rigby M. & R. Co., T. J. Rigby president and manager, and H. A. Clarke superintendent, will erect a 100-ton mill at Mayer. The process decided on is the Pohle-Crossdale. They intend to make same a custom plant for handling the ores of the district.

Mayer, May 25.

Near Congress, J. F. Holden and W. B. Akers have begun operations at the Last Chance mine of the Coronado G. M. Co. They intend to work this mine by a series of tunnels.

Development work on the Bunker Hill group at Bunker Hill, Lynx Creek district, near Prescott, is progressing. The ore body in the main shaft is 2 feet in thickness and running \$20 per ton in gold.

At the Bannie a steam hoist has been put in. On the Gold Dust mine of the Hudson group a vein of gold and copper ore, averaging \$30 per ton, is reported.

Work of building a mill and hoist to replace the one recently burned at the McCabe mine, at McCabe, will begin as soon as lumber and other material can be gotten on the ground. The shaft will be straightened, which will change the location of the mill and hoist slightly, but will add to the output. It was found the damage done by the fire to the shaft was more than at first thought.

The Jerome News says the United Verde C. Co. at Jerome propose to drive a tunnel 7000 feet from a millsite farther down the Verde river. The present tunnel is 3461 feet long. The new tunnel will cut the property at greater depth (1100 feet) and will avoid danger from fire. The United Verde smelters have been undergoing repairs.

There are 130 men at work at the Iron King mine, says the Prescott Courier. It is the intention of the American C. Co., operating the Iron King, to put in a smelter next fall. Their mill has a capacity of fifty tons daily, and the cyanide plant also has fifty tons capacity. The cyanide plant does not treat the mill product, but works a different class of ore. The crosscut on the ledge has been driven 90 feet, and is in sulphide ore.

YUMA COUNTY.

The King of Arizona mine and mill, near Yuma, have resumed after a shutdown of two weeks, during which time repairs were made in the deep wells, from which the water supply is derived.

ARKANSAS.

MARION COUNTY.

The zinc concentrating plants in Rush creek district, near Yellville, are running steadily and shipments are being made from the Buelah mine's mill and from the Morning Star mill. The shaft sunk on the Nakomis, at Dodd City, is said to have proven the correctness of the drill hole records, as it entered a run of lead at the level indicated. This company's mill will be put into operation next week. Shipments from the Almy mine in Sugar Orchard district have resumed. Additional machinery has been put in.

CALIFORNIA.

AMADOR COUNTY.

At the Zella mine, near Jackson, thirty-five stamps are dropping in the mill.

C. A. Marener is arranging to start work on the Vaughn (Champion) mine in Hunt's gulch, adjoining the Amador Queen, near Jackson.

The Superior Court last week granted a decree and judgment quieting title in

A. Hayward, Hobart Estate Co. and C. D. Lane of the mines and ditches near Plymouth owned by the Plymouth Con. G. M. Co. of New York.

The directors of the Argonaut G. M. Co. have decided to postpone the reopening of the Argonaut mine, near Jackson, until next year. The unsettled condition of the labor question is thought to be the cause for this action.

CALAVERAS COUNTY.

(Special Correspondence).—The annual report of the Gwin Mine D. Co. for the year ending March 31, 1903, shows 138,033 tons of ore mined and 138,383 tons of ore milled and concentrated, the difference being due to ore in the bins at the beginning of the year. There were 2010 83 tons of sulphurets (less moisture) produced, on which wagon and railroad freight, loading wagons and cars and smelter charges amounted to \$10.931 per ton of sulphurets, or \$0.1588 per ton of ore milled. The cost per ton of ore for mining and development was \$1.9443, for milling and concentration \$0.3060, making a total cost of production and treatment (including smelter charges) of \$2.4091 per ton of ore.

Gwin Mine, May 27.

A vein of ore running \$15 per ton is reported struck in the crosscut on the 200-foot level of the Maltman mine, near Angels, last week. Two 14-inch Cornish pumps are on the ground at the '49 mine, near Douglas Flat. Each pump weighs eight tons.

The Voinich M. Co., near Angels, are putting in hoisting machinery at the Voinich mine, and expect to resume shaft sinking by June 10.

Manager Williams says the Big Six mine, near Jenny Lind, has been incorporated and will be opened up next month.

EL DORADO COUNTY.

Men are at work on the Ford copper and asbestos mines, near Georgetown, and development work is being done on the Modoc and Van mines, all under the supervision of the El Dorado C. Co.

The Zantgraf mine, 7 miles from Auburn, Placer county, is being reopened and the plant which was destroyed by fire is being rebuilt, says A. B. Eastwood of Loomis, superintendent.

FRESNO COUNTY.

C. A. Canfield has leased ground from the Aetna Oil Co. at Coalinga and will start drilling operations next month.

McClurg & Claypool are rigging up for No. 3 well, near Coalinga. The company brought in a 200-barrel well in March and has No. 2 nearing completion. It is reported the Blue Diamond Oil Co. will resume next month, after being idle for a year.

INYO COUNTY.

A power transmission plant is being put up near Reward, from which power will be transmitted electrically 2 miles to the mill of the Reward G. M. Co., where induction motors will be used to drive a 20-stamp mill, air compressor and rock breaker.

KERN COUNTY.

The California-Sedalla Oil Co., near Bakersfield, are building another rig. The Diamond Oil Co. propose to put down ten more wells.

The Belgian and the San Francisco-McKittrick oil companies, in Kern river field, near Bakersfield, are shipping regularly. The McKittrick is producing 300 barrels a day and has 10,000 barrels in the slump holes. The Kern River Co. is erecting four additional rigs. The company is getting its water from the McKittrick Co., which supplies water to several companies from its artesian well.

At the coal mine near Garlock they have a 4-foot body of coal, says Superintendent B. E. Logan. They have put in a gasoline engine and blower.

A. Grant and I. N. Inskeep of Los Angeles have bought the Hard Cash mine, near Randsburg, and G. J. Bentley, former owner, is superintendent.

MADERA COUNTY.

The Yosemite C. Co. report work progressing at the Yosemite mine, near Daulton, on the Southern Pacific Railroad, and 2½ miles south of the Buchanan copper mine. Additional machinery is being put in. C. Van Timmons is superintendent.

MARIPOSA COUNTY.

W. Boldt and G. Helser are working the Simpson mine on Grizzly gulch, 1½ mile from Mariposa. They have cleaned out the shaft and will resume sinking.

MONO COUNTY.

J. Borland and G. Cremer have bonded the Beck placer claim near Bodie, and have put men to work taking out gravel for a mill test.

There were twenty-four mining locations recorded at Bridgeport last week. The oil fields at Mono lake are to be tested this summer.

NEVADA COUNTY.

Manager R. J. Simmons of the American Hill mine of the Sierra Nevada M. D. Co. says another shift was put to work last week, and the shaft, which is down 45 feet, will be sunk to 150 feet.

Work on a 1200-foot tunnel at Blue Tent, 4 miles northeast of Nevada City, began last week, says Superintendent C. J. Graham. It is thought the main channel will be struck at this distance.

After a shutdown due to an overflow of water caused by the heavy winter rains, the Conlin mine, near Grass Valley, has resumed operations, says the Tidings.

The La Bella mine, near Willow valley, near Nevada City, has been sold to New York men, and buildings and machinery will be installed. Grading has begun for a compressor and compressor house, says J. McGovern, of New York City, local manager for the company. The mine is worked by a tunnel, and it adjoins the Le Compton mine.

Superintendent English of the Culbertson and Syracuse mines at Graniteville reports work progressing, and an air compressor has been put in on the Culbertson property.

PLACER COUNTY.

At Dutch Flat the Golden Shaft Drift Co. has organized to develop the gravel deposits under the town of Dutch Flat and adjacent thereto, to a height not exceeding 9 feet from the bedrock, says the Colfax Sentinel. E. Malloes, J. L. Gould, A. A. Ferguson, J. M. Barney and R. Munroe are directors.

L. J. Littlefield has a bond on the Steep Hollow gravel mine, near Dutch Flat, says the Placer Herald.

PLUMAS COUNTY.

A. A. Sturges of Buffalo, N. Y., of the Sequin M. Co., says work will be resumed on their group on Rush creek, near Crescent Mills.

SAN BERNARDINO COUNTY.

The Bagdad Development Co. has been organized by C. K. McCormick of Salt Lake City, Utah, O. P. Posey and W. Bayly of Los Angeles, to work two groups of copper and gold claims at Bagdad. The company will prospect its territory with diamond drill.

A strike has been made 8 miles south of Amboy station by M. Plueff of Daggett, P. King and S. Alf of Ludlow. They have located eight claims. The ore body is exposed by three cross canyons; it is free-milling, averaging \$10 per ton.

SANTA BARBARA COUNTY.

At San Luis Obispo, last week, the Mulholland Oil Co. was incorporated, to operate on the Guadalupe rancho, a few miles southeast of Guadalupe lake. The directors are A. H. McKay, W. Mulholland, H. E. and J. A. Graves and W. R. Howland. The principal place of business is Los Angeles.

SHASTA COUNTY.

Kimberly & Co. of Salt Lake City, Utah, having an option on the Balaklala copper mines, near Kennett, have incorporated the Balaklala C. Co.; P. L. Kimberly, C. A. Malm, W. F. Snyder, C. D. Porter and S. Wiel, directors. It is intended to erect a smelter of 1000 tons daily capacity. W. F. Snyder of Salt Lake City is manager.

SISKIYOU COUNTY.

The second payment on the Snoozer mine on Russian creek, near Yreka, was made last week by the Zarina M. Co. of Chicago, Ill. They have men at work sinking a shaft on the ledge and expect to put in additional machinery.

It is reported the Hoboken mine, near Yreka, owned by Diggle's estate, will be reopened. It is on the south side of Cherry creek from the Cherry Hill, Drummer Boy and Mount Vernon mines.

W. H. Young of San Francisco has a bond on the Swain-Newson-Clever mine of White's gulch, near Etna, and has men running a developing tunnel on a porphyry dike.

J. M. Dobbins of Edgewood has started up the Puritan mine, near Edgewood.

TUOLUMNE COUNTY.

G. F. Beveridge of San Francisco has bonded the Blue Eagle quartz lode claim, in Jawbone district, near Groveland, together with water rights.

J. Phillips of Groveland, owning the Phillips, Antioch and Half Breed group of claims, will put up a 10-stamp mill on the mines.

J. A. McMahon has bought a third interest in the Silent Friend quartz claim, on the Tuolumne river, 4 miles from Groveland.

G. E. Reeb and E. I. Preston of San Francisco are reported to have bought the Haggin-Hearst interests in the Scorpion gravel mine, the Greelan Bend gravel mine (130 acres) and the Cook gravel mine near Columbia. The latter parties have since sold the Cook gravel mine to M. J. Wolfing.

Operations at the Sierra mine, near

Groveland, were resumed last week and sinking in the main shaft is in progress.

W. McCarthy has taken a bond on the Newsom mine, east of Groveland.

The Marguerite and Marian mines, near Yankee Hill, near Sonora, are showing a 4-foot vein of blue ribbon rock. The tunnel on the Marian is being run to tap the shaft.

The Big Creek M. Co. is developing several claims of a group of fifteen, 5 miles above Groveland, says Manager E. H. Wiley.

Lumber and other supplies are on the ground for the Don Pedro G. M. Co., south of Chinese, and development work has begun, says Manager W. H. McClintock of San Francisco.

Work was resumed in the Clif mine at Jacksonville last week, and A. P. Chittenden is superintendent.

Sinking continues in No. 1 shaft on the Harvard mine, near Jamestown, and is down 790 feet.

D. R. Oliver of San Francisco has bought the interests of Johnson & Fraser in the Mazeppa mine 1 mile south of Stent, and Superintendent J. L. Bryson has begun operations.

At the Doyle gravel mine, near Columbia, washing is in progress. An old shaft 500 feet from the working shaft has been cleaned out and pay gravel found at the bottom. Washing is also under way at the Woodside mine.

An ore shoot carrying good values is reported uncovered in the Bell mine, near Tuttle town.

TRINITY COUNTY.

The Chloride Co. is running thirty stamps on ore from the Chloride-Bailey group and the Jenny Lind, near Dedrick. From the former the ore is conveyed to the mill by an aerial tramway. From the Jenny Lind the ore is taken to the bins, 1000 feet by a double-track tramway, and then to the mill by a mule tramway, 1 1/2 mile long.—On the Ralston mine G. L. Bailey is taking out ore and doing development work. He has struck the ledge on the lower level. The mine is equipped with a 2-stamp mill.

At the Globe mine, near Dedrick, Superintendent Skinner has men at work and the air compressor is being put in place on Bear gulch. Connections are being made with the mine and mill. The mill will be run by compressed air instead of steam as formerly.

YUBA COUNTY.

Manager C. L. Crane of Camptonville says he has the machinery on the ground for a dredger to operate on the Middle Yuba river. Crane is also interested in the Honeycomb quartz mine near Camptonville.

COLORADO.

CHAFFEE COUNTY.

The Ohio & Colorado S. & R. Co. at Salida are increasing the capacity of their plant.

GILPIN COUNTY.

(Special Correspondence).—The Gower M. & E. Co., operating the Pierce mine on Winnebago hill, near Central City, has their new shaft down 200 feet. The first shipment made from this shaft netted \$109 per ton. They recently made a good strike in the first level. E. M. Messiter is superintendent. The Butler G. M. Co. is developing the Butler and Reno claims on Academy hill. They have a shaft down 350 feet. G. W. Mabey is manager.

Central City, May 25.

The Blue Grass M. Co. has put on another shift to handle the increased flow of water at their Lone Star mine, in Phoenix district, near Rollinsville, says Superintendent Alexander. They are crosscutting south on the west side at a depth of 150 feet, and also driving east. Iowa parties are interested.

At the Pierce mine at Central City the shaft will be put down another 100 feet, a total depth of 300 feet. Lead ore is being taken out of the 124-foot west level.

The Kansas-Burroughs Con. M. Co. has taken a lease on the Ophir-Burroughs mine on Quartz hill, near Central City, and will work it in conjunction with its other group of mines in that section. The machinery has been overhauled and the Gilpin Tramway Co. will lay a branch track there.

The Register-Call says the Celura M. & M. Co. has incorporated at Central City—H. M. Young, C. W. Adams, C. C. Thurman—to operate in Gilpin, Clear Creek and Boulder counties.

The Russell-Gilpin M. Co. has incorporated at Central City—J. & J. W. Best, F. N. Bancroft—to operate in Gilpin county.

The Mutual Benefit G. M. Co. resumed last week on its Pleasant View mines, on Gunnell hill, near Central City, and E. A. Reser of New York City is manager. The property has been idle for a number of years, so that retimbering was necessary. Work is being carried on in the 400-foot level, where they have opened up a body

of milling and smelting ore. The company has put in a plant of machinery and expects to begin shipments next month. The same company owns the Mldas tunnel and the Dallas group on North Clear creek, and they propose as soon as the Pleasant View is well under way to resume at these also.

B. G. Granville and J. L. Hocfler of Denver are putting up a concentrating plant on North Clear creek, near Black Hawk, and it is expected to have it in operation by July 15.

Sinking operations are under way at the Baldwin mine, below Russell Gulch, by the Wilkesbarre M. Co., and will go 100 feet deeper, says Superintendent Harrington.

Work began last week on the German and Phoenix mines, in Phoenix district, near Rollinsville, by T. K. Brooks, says the Register-Call.

G. D. Kaye, with Canyon City, Colo., and Cadillac, Mich., men, has bought the Stanley mill, east of Gilpin, and they have incorporated the Cadillac M. & M. Co. to operate the Friend and Myres groups. The Friend group is in Lump gulch, while the Myres group is north of Gilpin. Work was begun last week in sinking at both groups. The Stanley mill has five rapid-drop stamps and is amalgamating and concentrating.

Stevens & Co. expect to resume at their Victoria mine by June 1 and their shaft, down 150 feet, will be sunk deeper. They have smelting and concentrating ores.

The Rhoderick Dhu G. M. Co. are doing preliminary work at the Rhoderick Dhu and Protection mines on Quartz hill, near Central City, says Manager J. C. Fleischhut. They have started work on the Protection shaft, which will be the main working shaft of the group, and it has been retimbered. The gallows frame is being built and a double friction hoist and 35 H. P. boiler will be set up.

JEFFERSON COUNTY.

In addition to blowing in next week, at the Golden Smelting works at Golden, work will also begin on a refining plant of sufficient capacity to handle all the matter produced by the furnaces, says H. Berry, principal owner.

LAKE COUNTY.

Manager Dewey of the Bug G. M. Co., near Leadville, says additional machinery is on the ground and operations will be resumed June 1. The shaft will be sunk another 400 feet, which will give the company a 600-foot shaft, the diamond drill having proven up ore at that point.

A strike was made last week in the Caribou mine on Carbonate hill, at Leadville, of a 5-foot vein of chloride ore carrying 30% lead and eighty ounces of silver. J. F. Campion is interested.

The Matchless mine, near Leadville, will be reopened next week, says J. O. Callenette of Denver, who has a lease on it. There are three shafts on the Matchless and two of them are being worked by lessees, the main shaft, however, having been idle for several years.

The Fryer Hill M. Co. of Denver, operating on Fryer Hill, at Leadville, propose to build a smelter in Leadville to handle their own ore. The ore in the Fryer Hill mine is found mostly as iron oxide, sulphide and dry siliceous ore. This grade of ore is most easily and cheaply treated with a pyritic furnace. The company is doing development work through four shafts and are sinking two more. When these are finished shipping will be begun, and, with the ore in sight, they expect to take out 1000 tons a day. A. M. Gaines is president.

No. 4 shaft of the Ibez at Leadville is being sunk at the rate of 3 feet per day, and by July 1 it is expected the 200 feet will be sunk and connections made with the Yak tunnel. This will benefit both companies, especially the tunnel, as it will give ventilation and do away with the expense of driving compressed air to the heading, a distance of 2 miles. When the connection is made it is expected the tunnel will be driven further into Breece hill.

LARIMER COUNTY.

It is reported a vein 15 inches wide, carrying bornite and copper glance, has been opened at the bottom of the workings in the Bonbright group, near the Coldwater mine, 3 miles from Pearl.

SAN JUAN COUNTY.

G. C. Boss of Silverton says the Corn-cob and Liverpool claims, Red Mountain district, have been sold to Manager F. P. Tanner of the Hammond Tunnel Co. for \$8000. The Boss half interest in the Cloudy Day is bonded to the same company for \$5000. These claims are on the line of the Hammond tunnel. The Hammond tunnel is in 5000 feet and was started to cut the Tom Boy vein from the Red Mountain side.

The Eureka Exploration Co. have their tunnel on the Cascade vein to crosscut the Ridgeway vein at a depth of 1000 feet, driven in 300 feet from Maggie gulch, near

Eureka. The ore of the Cascade vein is a sulphide and carries values in gold and silver. Work will be resumed in the upper workings of the Ridgeway and shipping ore mined.

SAN MIGUEL COUNTY.

Manager E. L. Davis says the Mayflower G. M. Co. has been organized to operate the Mayflower group of gold lodes in Bridal Veil basin, near Telluride. He has begun development work. They will sink a shaft on the main vein to depth of 1000 feet, and open stoping ground in both directions from the shaft.

The management of the Liberty Bell G. M. Co. propose to build an addition to their mill, 1/2 mile above Telluride, which will include the enlargement of the present cyanide plant and the addition of machinery at an estimated cost of \$100,000, \$60,000 of which will be for machinery. This mill is treating 300 tons of mineral daily, which is yielding satisfactory values, two-thirds gold and one-third silver. The company has 250 men on its payroll.

The Alta mines, in Turkey Creek basin, near Ophir, are making regular shipments of ore and concentrates. The mill is turning out an average of two carloads, ten tons each, of concentrates per day. Some high-grade ore is shipped crude to smelters, and altogether the shipments, on the present basis, will amount to 100 carloads per month. The shipments are made from Ophir station, though the offices and headquarters of the company are at Telluride. N. T. Mansfield is manager.

F. T. Axtell, manager of the Caribean and Montezuma mines at Ophir, while maintaining the usual output of forty-five tons a day for the concentrating plant, has additional men doing dead work and getting the mine in condition for an increased production. The owners are in litigation with the Suffolk-Globe M. & M. Co. over the placer on which the mill is located, and as soon as it is adjudicated a larger milling plant will be built.

SUMMIT COUNTY.

In the Ten-Mile district, near Breckenridge, a strike of galena is reported by Ryan & Allen, who own a group of lode claims on the southwest extension of the Wheel of Fortune group. Assays show forty ounces silver, \$15 gold and 30% lead.

TELLER COUNTY.

A strike was made last week in the main working shaft of the Burns of the Aescia Co. at Cripple Creek, being made in the second level and south of the shaft, near the Pharmacist line. Johnson & Smith found ore showing sylvanite and free gold, says the Times. They are working under a sub-lease from Udick & Devine.

Sinking is in progress by the South Burns Leasing Co., operating on the south end of the Burns claim of the Aescia Co., Cripple Creek. They are down 165 feet and will cut a station and drive for the vein. They are washing the dump made from the ore that was hoisted from the first level.

The Jack Martin Leasing Co. has a two years' lease on the middle block of the Morning Glory No. 4 of the Work Co., Cripple Creek, from the surface down to the Ophelia tunnel level, which is 435 feet in depth. It is intended to explore for the Howard vein of the Mary McKinney.

The August Flower Leasing Co., operating the Katinka Co.'s ground on Guyot hill, near Cripple Creek, have set up the boilers and the compressor is being put in. It is expected that sinking will be resumed next week and will continue to a depth of 700 feet. The company is shipping 350 tons of smelting ore per month.

Operations were resumed last week on the Hawkeye mine at the head of Barnard creek, near Cripple Creek, and sinking is in progress. Machinery has been put in.

The Stratton mill and the dump at Gillett has been leased to F. J. Butters & Co., who intend cyaniding the dump.

Operations have been started on the Great Western mine, near Gillett. A plant of machinery has been put in.

Manager C. S. Keifer says he will start up operations on the group of the Nickel Plate Co. that owns thirty acres of ground between Copper and Rhyolite mountains, near Cripple Creek. There are two shafts—one is down 150 feet, while the main working shaft is 465 feet in depth. Besides the work to be started on copper mountain the company intends resuming on their Squaw mountain group, the King Solomon, which adjoins the Little Puck. The upper portion of the ground has been leased for a period of two years yet to run. With this company at work there will be three steam plants in operation on Copper mountain.

The lease of Smith & Altman on the Elizabeth Cooper of the Doctor-Jack Pot Con. Co. at Cripple Creek has been amended so as to permit of mining to a depth of 700 feet. Work was previously limited to the bottom level of the Smith & Riley shaft, 450 feet in depth, and from these workings the lessees are making a

steady output and are employing twenty-five miners. They will work the additional block of ground through the 700-foot level of the Morning Glory shaft.—Taylor & Co., leasing on the Buckeye of the Old Gold Co., have begun building an ore house and will make other surface improvements at the mine.

IDAHO.

BOISE COUNTY.

The Twin Sisters mine at Centerville has taken on more men and will have a mill in operation this summer.

The Twin Sisters Co. are stoping ore from the 200-foot to the 100-foot level in their Golden Star mine, near Idaho City, says Manager Ingle.

CANYON COUNTY.

D. T. Miller, S. Adams and G. Marshall of Boise, and J. H. Dodds, J. Kiroff, J. S. Barnett and T. J. Duddleson of Pocatello, have organized a company and will prospect for coal on Payette river, above Horseshoe Bend. A shaft will be sunk, first, to determine the value of the deposit which shows a 6-foot vein on the bank of the river. The field is on the line of the Dewey extension, which has been surveyed, and is 16 miles from Payette. Other Boise men have located coal lands in the surrounding hills where croppings of coal show on the surface, and a number are operating with diamond drills.

CUSTER COUNTY.

A strike is reported made in the White Knob mine at Mackay last week, showing an 8-foot body of ore in a prospecting drift being driven north from the main level. Assays show 5% copper and \$1 gold and silver. P. L. Fearn of Boise is consulting engineer.

LEMHI COUNTY.

D. Kane of Salmon City reports development work progressing in the coal mines which have been opened up near Salmon. A good product is being turned out and is marketed at \$5 per ton.

SHOSHONE COUNTY.

Wallace advises say the bringing of electric power into that district by the Washington Water Power Co. of Spokane, Wash., will materially reduce working costs in the mining industry of the Cœur d'Alenes. Power will be sold to the mines at \$50 per horse power per year. The mine owners say that with steam it now costs them \$110 to furnish 1 H. P. per year. There are four companies in the deal, although other companies will take power—the Standard, the Hecla, the Mammoth and the Empire State-Idaho companies. The last named operates the Last Chance mine at Warden and the Tiger-Poorman at Burke. These companies have contracted for 1500 H. P. per year for five years at the rate of \$50 per horse power per year. The Mammoth will use electricity to run its compressor, light the mine and operate its motor cars. The Standard will use it for its two compressors, pumps, lighting and motor cars. Additional machinery is being put in for electric pumps. At present they will not use electric power to operate the drills. The other companies which will use electric power are the Bunker Hill & Sullivan, Crown Point, Morning, Frisco and Hunter. Transformer stations are being built.

The Oreano M. Co., operating a group of claims northeast of the Standard, near Wallace, is pushing development. The crosscut tunnel is in 250 feet, and they expect to cut the first lead at 300 feet. There are two leads and it will take a 1600-foot crosscut to explore both.

In Pine Creek district, near Warden, fifteen men are at work on the Highland Chief mine. The mine is owned by H. T. Gilbert, C. S. Lamb and J. B. Pipes.—At the Constitution men are crosscutting the vein and have shown up 14 feet of ore.—E. Booth and I. L. Melton are developing the "V" group of claims.

WASHINGTON COUNTY.

Manager E. L. Hollingshead of Weiser says the Weyant M. Co. has been organized at Toledo, Ohio, to take over the Alliance gold and copper mine on Rapid river, near Weiser, reports the Signal. The price is given as \$40,000. The company propose to build a milling plant after development work is under way.

C. F. Macey, superintendent of the Iron Springs M. Co., in Rapid River district, near Weiser, says a hoisting plant is being put up. A three-compartment shaft will be sunk on the vein and levels run. Miners are at work in the tunnel, which has been driven in 340 feet, and is on the ledge, from which ore is being taken and piled on the dump. The tunnel cuts the ore body at a depth of 250 feet from the surface.

KANSAS.

WYANDOTTE COUNTY.

Twenty acres of land adjoining the present site of the United Zinc & Chemical Co.'s Argentine plant, near Kansas City,

have been bought and the company will start work on an increase of their plant.

ALLEN COUNTY.

At Iola, work is under way on an additional block of zinc furnaces, the fourth, at the Standard Acid Co. plant.

MICHIGAN.

HOUGHTON COUNTY.

Houghton advices say nothing will be done at present to prepare for an addition to the Trimountain stamp mill at Edgemere Junction. A rock supply of 2000 tons daily is to be maintained and development work increased on the north end of the mine at Trimountain. No. 4 shaft is down 370 feet, and the second level drift north is being driven in the direction of the proposed No. 5. No. 1 shaft is sinking to the eleventh level at depth of 1170 feet. No. 2 is sinking to the tenth level and No. 3 to the ninth.

No. 3 shaft at the Wolverine, near Kearsarge, is sinking from the twenty-fourth to the twenty-fifth level and No. 4 from the twentieth to the twenty-first. Twenty-five drills are in operation in the mine and twenty-three are getting out rock for the stamps. An additional boiler capacity of 200 H. P. will be put in at No. 4 shaft, making three there.

The plant of the Lake Superior Concentrating Co. on the Franklin sands, near Hancock, has resumed for the season with improved equipment and increased capacity. A new pumping plant has been put in and the belt conveyor replaces the centrifugal pump in elevating slimes for treatment by the tables after passing through the jigs.

The two months' practical test of the inclined mortar grate designed by Superintendent Key for use at the Adventure mill has shown its economy, says Key. The head thus fitted has maintained a record of 535 tons in twenty-four hours, against 487 tons, the best previous record by the Adventure on a vertical cylindrical grate.

At the Wolverine, near Calumet, the crosscut from No. 3 shaft has opened up the West Kearsarge lode. The vein is 6 feet in width.

The working shaft of the Franklin Junior mine, near Hancock, is sinking from the sixteenth to the seventeenth level and stopping rock has been shown, especially below the fifteenth level in the southern part of the mine. No start has yet been made on the second shaft marked off last fall.

At the Winona mine at Winona they are raising from the third to the fourth level at No. 3 shaft. Work is also being carried on from the surface of this shaft. The management is said to be contemplating putting in a small stamp mill for the mine.

President Todd of the Quincy M. Co. says the underground electrical tramming equipment will be completed and in operation July 1.

The removal of the Champion's stock pile, estimated at 80,000 tons, was commenced last week, says the Financial News. Present shipments consist of a few cars daily, but the volume will be increased when the fourth stamp enters upon its career. The Champion lode was discovered four years ago, and it is estimated that the openings since made will supply the present mill capacity of 2000 tons daily.

KEWEENAW COUNTY.

It is expected the Mohawk, near Allouez, will be hoisting from four shafts and stamping with three heads before the end of the season. This will be the result of equipping No. 4 shaft with a steel rock house and a double conical drum hoist, capable of hoisting from a depth of 4000 feet, and the erecting of a third head at the mill. The deepest openings of the mine are in No. 1 shaft. Sinking is now under way at shafts Nos. 2 and 4. Twenty-nine drills are in operation in the mine. The hoist at No. 2 will be permanent and four-ton skips will be put on as soon as it is installed.

The Cliff mine, near Phoenix, is to be dismantled. The property has been idle for a number of years.

A start has been made on the Allouez shaft for the Kearsarge lode, near Allouez, says Superintendent Chynoweth. The shaft will go down at an angle of 80°, 1000 feet before striking the lode.

Near Allouez, the Rhode Island copper values are reported improving. It is thought the new shaft is not on the Pewabic lode, as at first supposed, but on the East lode, a branch of the Pewabic. The crosscut to the west and the bottom of shaft on the 1000-foot level cut what is supposed to be the Pewabic lode at 85 feet from the shaft. One machine is stopping there and is yielding good rock. The results on the Allouez conglomerate opened to the east on this level are not encouraging.

MISSOURI.

FRANKLIN COUNTY.

The Missouri Copper Mountain M. Co. are developing a group of mines near Sullivan which show a body of copper sulphurets and carbonates. A concentrating plant is being built. The ore is said to average 10% in copper. It is expected the mill and furnace will be ready for operation by Aug. 15th.

MADISON COUNTY.

The annual report of the Catherine Lead Co., operating a group of lead mines near Fredericktown, says the directors propose to build a lead smelter which will enable them to save their nickel and cobalt values. All the labor troubles which this company encountered during the past winter have been overcome and the mines and mills are again working at their full capacity, says the Lead & Zinc News.

MILLER COUNTY.

New York men are reported to have bought the properties of the Gageville M. Co., near Tusculumbia, for \$40,000. This deal includes the Gageville lead mine, owned largely by Jefferson City men. Other lands will bring the aggregate holdings of the company up to 1800 acres, including the Buster mine.

SAINT FRANCOIS COUNTY.

Plans are being prepared by the St. Joseph Lead Co. for a concentrating plant to be built at its Hoffman shaft, near Bonne Terre, and it is expected to be in operation in the fall. The mill will have a capacity of 250 tons per day. This company's smelting plant at Herculaneum (Jefferson county) is being enlarged.

MONTANA.

BEAVERHEAD COUNTY.

At the Ajax mine, near Dillon, Superintendent W. B. Stanchfield says an ore body 4 feet wide has been struck on the hanging wall while driving the upraise from tunnel No. 2 to tunnel No. 1. It is proposed to increase the milling capacity this summer.

CASCADE COUNTY.

The Gerber mine at Sand Coulee will increase its production of coal. The management has built a boiler house at the entrance of the mine and is putting in four 90 H. P. boilers, one 250 H. P. engine, one 12 H. P. engine, one 24-inch compressor, six machine drills, six coal cutters and two pumps. With the new machinery they expect to get out 700 tons of coal a day.

CUSTER COUNTY.

Kircher's coal mine, near Miles City, is being entered from a new quarter since the settling in of the old workings recently. It was found that the roof was becoming unsafe and the tracks and other equipment were being taken out and the ground allowed to cave in. Work on the shaft has begun and the mining of coal will be resumed next month.

FLATHEAD COUNTY.

J. Riley, part owner of the Way-Up mine, near Libby, says a fan run by water wheel has been put in to ventilate the workings. There is 450 feet of piping. A tunnel is being driven, O. C. Thomason superintendent. The Way-Up is on Goat mountain, between the headwaters of Libby creek and the West Fisher, and is being developed by a series of tunnels run on the vein, which carries values in gold, with sulphides.

GALLATIN COUNTY.

Superintendent C. Rabe of the Bozeman Corundum Co. reports that he has sunk the new shaft, known as the Cabin shaft, to a depth of 75 feet, and found the vein there wider than hitherto developed. Also a better quality of crystals was exposed.

JEFFERSON COUNTY.

Work will be resumed on the Buckeye mine, in Jack Creek district, 12 miles north of Basin, as soon as the snow clears enough to allow the opening up of travel. The owners have contracted with L. Sponheim and A. Freeburg to develop the mine.

The Boston & Seattle M. Co. has a lease and bond on the Peerless Jennie mine, near the Josephine mine, in Jack creek, near Basin. It is stated the company will work the dumps and put in machinery to develop the mine. This company controls the Ontario group and has let a contract for a smelter to be built at the mouth of the Cataract tunnel, says General Manager Lott of Helena.

The High Ore mine, in High Ore district, 5 miles east of Basin, has been started up by Eastern men. Two shifts of machine men are driving the tunnel into the mountain to crosscut the lead which outcrops on the surface. The tunnel is in 1800 feet and the lead will be cut at depth of 850 feet.

The Buckeye mine, in Jack Creek dis-

trict, near Basin, and 3 miles northwest of the Bullion mine, will be developed by Sponheim & Freeburg.

LEWIS AND CLARKE COUNTY.

It is reported that men have been put to work by the Montana M. Co. at the South Drum Lummom and the Cruse Mountain Con. Co.'s groups, near Marysville.

D. L. Wing of Chicago, Ill., owning the Winslow-Burns placers in Emigrant gulch, near Marysville, is working ten men.

MADISON COUNTY.

(Special Correspondence).—The Garnet G. M. Co., operating near Pony, are driving their No. 3 tunnel, started near their mill last winter. A power plant for an electric machine drill is being built, and as soon as completed it is expected to let a contract for driving 1250 feet of crosscut, says Superintendent E. L. Ballou. Pony, May 25.

H. Kelly has a two years' lease and bond on the Dennis Hurley placer, in California gulch, near Virginia City, for \$2500. He has men at work opening up the ground.

J. T. Conner of Helena, superintendent of the Granite Mountain mines at Summit, says the company let a contract to J. Devlin and F. Walker to sink a shaft on the Apex claim 200 feet, after which it is expected the Granite Mountain Co. will put up a hoisting plant.

The Standard mine, in Pony gulch, ½ mile above Sterling, owned by J. Pollard, J. Northey and S. Lintecum, made a shipment of ten tons of ore last week to the smelter which returned \$200 gold per ton. The mine is being developed through a tunnel which has opened up a 6-inch shoot of shipping ore and 4 feet of a lower grade free milling ore. There is a shaft 50 feet deep, with ore in the bottom.

At Rochester E. M. Hand, superintendent of the Watseca mine, reports operations in full blast and the mill running steadily. The mine is worked through a vertical shaft. Mr. Hand is also interested in the Watseca Extension, adjoining.

The Rochester G. M. Co. has sunk a shaft 200 feet on its group, near Rochester, and in two drifts has struck ore showing values in gold.

PARK COUNTY.

President R. D. McNulty of the Milwaukee-Montana Natural Bridge G. & C. M. Co. reports work progressing on their group of ten claims in Natural Bridge district, near Livingston. They have a stamp mill and tramway.

J. W. McGann and C. W. Shultz have located the Standard No. 6 quartz lode claim in Sheepeater district.

T. & H. F. Hardon, with J. P. & C. M. Allen, have located the Broadwater placer claim in New World district.

SILVER BOW COUNTY.

The High Ore mine, 5 miles from Butte, has been bonded to Eastern men, says the Butte Inter-Mountain. Men are at work driving the main tunnel through the lead.

NEVADA.

ELKO COUNTY.

T. Conners, M. Arnold and G. Hubbard report opening a 4-foot ledge of lead ore in their mine at the south end of Ruby range, near Elko. Teams will begin hauling ore to Elko next week, from which point it will be sent to a smelter.

LINCOLN COUNTY.

The Quartette M. Co. at Searchlight has posted notices to the effect that on and after June 1 all employees not affected by the eight-hour law will be required to work nine hours.

NYE COUNTY.

At the Rescue mine, near Tonopah, the machinery is in and sinking and hoisting begun in the shaft, which will be continued to depth of 500 feet. — A hoist is being set up at the United Tonopah mine and the shaft will be sunk to depth of 600 feet.

The Tonopah-Gold Mountain M. Co. are breaking shipping ore from the Monte Cristo claim, that is being sacked at Gold Mountain, near Tonopah.

A steam hoist is being set up on the Tonopah-Fraction Extension, near Tonopah, says C. E. White. The shaft is down 245 feet.

Superintendent J. J. Moss says the Tonopah-Albemarle G. M. Co. has been incorporated at Campbell, N. Y. They own twelve claims, which adjoin the Mizpah Extension and the Butte-Tonopah at Tonopah; J. Troy, H. Weber, W. L. Hamilton, F. F. Richmond, B. Glidden are directors. A two-compartment shaft is being sunk.

The litigation which has been pending for the past three months between the Esperanza M. Co. and the Lone Mountain Horn Silver M. Co., involving an alleged overlapping of claims on Lone mountain, near Tonopah, has been settled out of court, says President J. M. Healy of the

Horn Silver. Z. Kendall is manager of the Esperanza. Work has resumed on both properties.

At the Colehan mine, near Tonopah, work has been temporarily suspended at the 200-foot point, pending the arrival of the hoisting plant.

STOREY COUNTY.

Drill hole No. 3 on the Brunswick lode at Virginia City is down 290 feet, and the bottom is in clay and porphyry, says Manager Ryan.

Superintendent Kyle of the Silver Hill mine, near Virginia City, shipped a bar of bullion valued at \$4001.59 to the company's office in San Francisco last week. The bar represents returns from 250 tons of ore.

WASHOE COUNTY.

F. Crowell of San Bernardino, Cal., reports finding free-milling gold ore near Lone Butte, 100 miles north of Reno. The region of the strike is in a somewhat inaccessible cattle country, which years ago contained a number of placer diggings.

F. E. Miller of Westfall, Mass., manager of the Springfield-Nevada M. Co., at Olinghouse, near Wadsworth, says both mills are in operation. The Kinkadee mill will be put in order this week at the lower mill, which will be known as mill No. 1, and the Slip as mill No. 2. This will increase the capacity of mill No. 1 by six tons per day.

On Cabin No. 2 mine work in the lower tunnel consists of an upraise to carry a stope of 120 feet to the surface. They are timbering with square sets with chutes placed every 30 feet, so as to load ore in car direct from stope. — Work at Slip and Renegade continues on the tunnel, which is in 770 feet.

Superintendent J. H. Sheehan says he is cleaning out the lower tunnel on the Crown Point mine at Olinghouse, near Wadsworth, preparatory to further development.

NEW HAMPSHIRE.

GRAFTON COUNTY.

A strike of gold-bearing ore is reported from Lyman on ground owned by E. H. Mason in north part of town. Free gold is shown.

NEW MEXICO.

BERNALILLO COUNTY.

R. L. Baca of Santa Fe has located nine claims in the Sandia mountains, 7 miles east of Bernalillo, on which he reports finding copper ore. It is claimed there are evidences of shafting and other workings and that these mines were worked formerly by the Spaniards.

GRANT COUNTY.

El Paso, Tex., advices say on and after June 1, 1903, the underground men and carmen at Santa Rita will receive an advance of 50 cents per day in wages, and that the arrangement will hold good as long as copper maintains its present price.

LINCOLN COUNTY.

Reports from Estes City state that the Sunflower M. Co., D. Sanders manager, is considering the erection of a plant to treat the copper ores of the Sunflower mine, near Estes.

SIERRA COUNTY.

The South Percha G. M. Co., A. J. Hirsch manager, report work progressing on the Great Eastern mine at Hillsboro. Two veins are being opened up.

Near Hillsboro, the Wicks mine of the Las Animas G.-C. M. Co. will have a mill of fifty tons daily capacity, says W. W. Williams of Hillsboro, manager. — The Black Peak G.-C. M. Co. has organized to operate the Black Peak and Washington groups of mines near the Wicks mine, and W. W. Williams is manager, says the El Paso, Texas, Herald.

TAOS COUNTY.

The concentrator at Twining is treating seventy-five tons of ore daily. O. W. Alexander of Cerrillos is superintendent of the smelter. — The Mamie Garro M. Co. will put in a mill. — Reports say the San Cristoval M. Co. propose to build a cyanide plant.

OREGON.

BAKER COUNTY.

The Virtue mine, near Baker City, Manager A. Buckbee, is only milling a small quantity of selected ore from the prospect shaft of the Pittsburg & Chicago claims of the main group. A main three-compartment shaft is being sunk and will go to 1500 feet.

The White Swan mine, near Baker City, owned by the White Swan M. Co., has the lower levels unwatered and is hoisting good ore from the fourth level and milling twenty tons per day in the 10-stamp mill, says Superintendent W. O. Reynolds. He has uncovered a shoot of milling ore on the third level and is sinking the shaft below the 400-foot point, but is hampered by a heavy flow of water.

The Conner Creek 30-stamp mill, near

Baker City, is dropping ten stamps. The crosscut tunnel failed to tap the payshoot at the depth expected and further work is necessary. H. Myrick has taken an option and bond on the mine.

T. S. Kenoerly, superintendent of the Gold Coin mine, in the Greenhorns, near Sumpter, says machine drills have been put to work this week. The tunnel is 10 500 feet, with 1300 feet yet to drive. The five ledges which this will cut average 4 feet in width and carry good surface values. The Gold Coin adjoins the Phoenix, Don Juan and Goldoos Eagle.

J. Arthur and the engineering firm of McEwon & McEweo of Sumpter have formed a partnership to establish an independent sampling and testing plant at Sumpter which will have a sampling capacity of thirty tons a day and milling capacity of seven tons daily. It will consist of three stamps, 6-foot concentrating machines, a small cyanide plant, with silico tables attached and other equipment for treatment and ore tests for any amount up to 100 tons. There will be a laboratory in connection for custom assaying.

Because the electric power companies that proposed to enter the Cracker basin, near Sumpter, this season show no signs of early work, Manager L. V. Swiggett of the Orleans mine says that he has concluded to put in a steam hoist of 500 feet capacity instead of depending on electrical energy. The shaft will be sunk near the vein, starting in country rock off the haaglog wall.

Work will be resumed on the Newman group, Greenhorn-Bonanza district, near Sumpter, says H. F. Ramm of Bay City, Mich., secretary.

The gasolite hoist on the Humboldt, Greenhorn district, near Sumpter, is in operation and sinklog resumed in the double-compartment shaft, which is down 60 feet, says Superintendent Brady. The hoist has capacity for a depth of 300 feet. They will sink to 200 feet and drift both ways on the vein.

Last week the Geisler-Hendryx Investment Co. bought the Gray Eagle claim, adjoining the Red Boy mine, near Sumpter, and also adjoining the Blue Mountain group, owned by the company.

Manager W. L. Vinson of the Montie G. M. & M. Co. says he has started up the Bryan mill on the Emma mine, near Baker City. This mill has a capacity of twenty-five tons per day.

GRANT COUNTY.

The Badger mine, near Susanville, is shipping sulphurets to the smelter at Tacoma, Wash.

JOSEPHINE COUNTY.

W. T. Cope is developing the quartz mine of Schrimpf Bros. on Maple gulch on the Applegate river, near Provoit, under bond.

SOUTH DAKOTA.

CUSTER COUNTY.

The Black Hills Porcelain, Clay & Marble Co. propose to begin operations on their quarry of lithographic stone, 14 miles west of Custer, and will do some work on its marble beds also. Regular shipments of mica continue from the mine northeast of Custer to Columbus, Ohio.

The Central Black Hills C. Co. have put in machinery at their mine near Custer, says Manager E. M. Barnes, and expect to begin operations next week.

LAWRENCE COUNTY.

The Spearfish G. M. & R. Co., near Spearfish, are running their cyanide mill regularly and making two clean-ups per month.

Manager E. M. Holbrook of the Horsehoe M. Co. says they are still shipping ore to Denver, Colo., from the Lucile and Ben Hur mines, and work on the cyanide plant in Ruby basin, south of Lead City, is progressing. It is expected that this plant will be ready for operation by July 1, and will start with a daily capacity of 500 tons.

The Imperial Co. have operations under way on their Juno lode at Bald mountain, near Lead City. A tunnel will be started lower down than any former workings and to tap the ore bodies at greater depths. The company is opening up ore in the Eagle Chief lode, which is over the divide from the Juno, near Crown Hill station. The mill is running full capacity.

Pending the enlargement of the Dakota M. & M. Co.'s cyanide mill at Deadwood the company has increased development work of the ore bodies.

PENNINGTON COUNTY.

The Holy Terror M. Co. of Keystone have the Keystone 20-stamp mill running on Holy Terror ore. President Hughes says they are taking ore from the seventh and ninth levels of the mine. At present the flow of water is heavy, making it expensive to keep the mine dry. The concentrates will be sacked and held for the present, with a view of sending them to a smelter. The ore from the Keystone is only partially free-milling, carrying also

some values that will not amalgamate, says the Black Hills Review. Experiments have been carried on seeking the best method of treating this ore.

TENNESSEE.

SMITH COUNTY.

There were 100 tons of fluorspar shipped to Nashville last week from a vein being opened up near Rome. The vein is said to be 100 feet wide and it occurs in crystalline masses with distinct cleavage planes, which makes mining easy. The cost of milling is reported at 75 cents per ton, while the selling price is \$7. Most of it will be used in blast furnaces.

TEXAS.

NACOGDOCHES COUNTY.

A strike of gold ore is reported 62 miles east of Douglas, at Antelope pass, on the El Paso and Southwestern Railroad. The find was made in a ledge of white quartz and oxidized iron, 10 feet wide, running northeast and southwest. Assays run \$15. There is water 1 mile away in the Animas valley at depth of 10 feet.

UTAH.

JUAB COUNTY.

The Western Exploration Co., which owns the Sioux-Ajax or Farrell mill at Robinson, has invited bids for the entire plant, which is to be dismantled, says the Tintic Miner.

PIUTE COUNTY.

(Special Correspondence).—The Baslen springs group of C. Mathews, on Deer creek, near Marysville, has been sold to Salt Lake men.—The Iron mine, east of Marysville, is regularly shipping a car a day and will begin shipping two cars a day.—L. H. Bartholomew will begin operations on the tunnel in the Copper Belt this week. Boston men are interested.

Marysville, May 25.

The Ryan holdings in the Golden Star mine of Gold mountain, near Marysville, have been added to the Annie Laurie M. Co. holdings. With this the holdings of the Annie Laurie Co. on Gold mountain, says Manager Rader, are increased to 1364 acres, with 5200 feet along the strike of the ore zone.

SALT LAKE COUNTY.

The management of the Tintic M. & D. Co., operating at Bingham, and in Tintic district (Juab county), have incorporated the Yampa Smelting Co. and the West Mountain Tramway Co., with G. H. Robinson, managing director of the Tintic M. Co. as manager of the new companies. The smelting company by which the furnaces will be provided is organized under Maine laws, the transportation company which will provide economic means for the transmission of the company's Bingham ores under New Jersey laws. On each of these, says Manager Robinson, construction will begin next month.

Work on the tunnel by which the ground of the Mt. Aetna G. & C. M. Co. at Bingham was being opened up was resumed last week, says J. A. Kaufman, manager. The Mt. Aetna adjoins the Last Chance on the south and west.

Although the breast of the drain tunnel, now 6000 feet into the mineral zone, is 2500 feet distant from the main Dalton ledge on the Bingham Con's Bingham properties, the water has been lowered 12 feet, while the flow from the mouth of the tunnel has increased to 2500 gallons per minute, says the Salt Lake Tribune. The Brooklyn ledge is expected to be cut at 140 feet farther. While the tunnel is being driven, the Brooklyn shaft is being cleaned out to the 1500-foot point. On the 1400-foot level Manager McVichie has drifted for 200 feet along the ledge, showing copper-bearing sulphides. At 1500 feet drifts will be started.

Manager F. Cook says the Columbia C. M. Co. will begin work on a concentrator at the Columbia mines, near Bingham, next month.

Manager R. H. Channing of the Utah Con. says work to increase the capacity of its Utah smelter, at Murray, in which the ores of the Highland Boy mine at Bingham are reduced, will begin next month. The smelter is treating 500 tons of ore daily.

SUMMIT COUNTY.

Superintendent Mixer of the Creole mine, near Park City, says he has shut down temporarily, due to surface water. The shaft is down 470 feet and he will go to the 500-foot point before drifting.

UTAH COUNTY.

The Union Chief M. Co. has incorporated at Salt Lake City; A. O. Jacobson, A. E. Snow, J. A. Jacobson, A. D. Larson, A. Snow. The company owns seven full lode claims near Santaquin.

WASHINGTON COUNTY.

R. A. Kirker, of Salt Lake City, has an

option on the aothradic coal measures at New Harmony, 8 miles south of Iron mountain, for Eastern men. The group covers 1000 acres, through which three parallel veins are running and on one of which a depth of 100 feet has been attained.

WASHINGTON.

FERRY COUNTY.

A. E. Palmer of Spokane has bought control of the Mountain Lion group at Republic. He has closed a contract with the Granby Smelter Co. for the entire output of the mine for two years. There is a mill on the ground and the mine has been developed to a depth of 600 feet.

KITTITAS COUNTY.

A 4-foot ledge of free-milling gold ore has been found 30 miles from Ellensburg, on the western slope of the divide between Swank creek and Lyons gulch, says F. J. Loog of Ellensburg.

STEVENS COUNTY.

Manager E. J. Wilson reports four furnaces running on the Le Roi smelter. He is having everything fed against the blast, instead of to the center of the furnace. Ten to twelve charges per hour are going through. Fourteen charges were worked on No. 5, but that could not be kept up. The speller plates are in use again, after an idleness of nine months. The low-grade matte will be resmelted and made high grade before sending to refinery. At present the matte crusher is working entirely on low grade. No coke reserve is on hand and only a few cars in the yard. There is no chance of the works running any length of time, unless a steady supply comes in. There are 300 men on the payroll.

J. W. Douglas of Spokane is interested in the Standard Marble Co., whose holdings are on Young America hill, 1 mile east of Bossburg. Quarrying and finishlog machinery is on the ground.

FOREIGN.

AUSTRALIA.

NEW SOUTH WALES.

Cope's Creek Dredging Co., near Inverell, are making an average output of five tons of tin weekly, of a value of £450.—Tioha Tin Dredging Co. have begun operations, and also the Cope Hardinge Tin Dredging Co.

The output of tin for the year ending December 31 last is 600 tons 2 cwt.; this includes Inverell and Tioha districts. This total tonnage is 70 tons short of the previous year, but for 1903 the returns are expected to reach 1000 tons.

The Australian Gold Recovery Co. has bought the Aladdin and Wentworth tailings dumps at Lucknow, and arrangements have been made for their cyanidation.

WEST AUSTRALIA.

At Coolgardie, the Lady Loch has its 15-head battery in operation on ore mostly from the 650-foot level, running one ounce to the ton.—The Lady Robinson is opening out a new main shaft at the 230-foot level. The company have put in an air compressor and a heavier winding engine.

The annual of the Great Boulder Perseverance G. M. Co., Kalgoorlie, just issued for 1902, shows 140,642 tons of ore and 41,392 tons of oxidized tailings and slimes treated for 193 383 ounces of bullion, valued at £693,215, the profit of which, after deduction of administrative charges in Australia and London, amounted to £412,683 14s 3d. The sum of £37,504 3d was expended on development work and £22,945 7s 8d on equipment accounts. The sinking of the main shaft has been resumed, and it is proposed to open up at 1100 feet and at each 200 feet below that depth.

At Kalgoorlie, in the Oroya north block of the Oroya Brown Hill mine the value of the ore met with in sinking Pomeroy shaft from 860 feet to 864 feet was four ounces per ton, the ore containing telluride.

BOLIVIA.

Advices from Oruro report the finding of tin ore at Tres Cruces.

BRITISH COLUMBIA.

R. Gibbs and R. Grant, operating the White Moose mine, near Atlin, report striking ore showing values in copper, silver and gold.

Negotiations for the sale of the Gibson group, on the South Fork, near Kaslo, for \$30,000 are under way, says Manager A. Smith.

J. Rutherford of Chicago, Ill., has started work on the Glengarnock, on Tenderfoot creek, near Kaslo.

At the Ruth operations have resumed, says Manager H. B. Alexander.

At the annual meeting of the Yreka Copper Co. in Tacoma, Wash., it was decided to open up the Superior group of

claims, which adjoin the Comstock, which is being operated. An aerial tramway will be put to aid the property put on a ship-log basis. C. W. Riddell of Tacoma, Wash., is president.

The Kootenay Co. have decided for the present to suspend operations at the Nickel Plate mine and concentrate their work on Rosland on the Kootenay mine. So soon as the Kootenay has become productive it is intended to resume operations at the Nickel Plate, and also that the Great Western mine will be unwatered and prospected.

Superintendent Hewitt of the Otter Creek Hydraulic Co., on Otter creek, near Atlin, expects to have the plant in full operation by June 15.

Superintendent A. McPherson, at the National Hydraulic, near Quesnelle, is driving ahead the bedrock tunnel begun last fall and expects to break through the bedrock rim into the gravel by June 1, and will then lay a flume in the tunnel and begin piping.—J. Descon is piping on the McLean claim, Quesnelle river.—The boring operations by the Cariboo Con., Ltd., on the Eleven of England, Lightning creek, are progressing. Two holes have been driven to bedrock and another started. J. Windle is foreman.—B. A. Lasell has begun work on Cunningham and Cblna creeks and will be ready to pipe as soon as the water starts.

R. O. Jennings has begun development work on the Deane mine, near the North Star mine, near Fort Steele, says the Rosland Miner.

Trow & Boynton, owners of a placer lease on Perry creek, near Fort Steele, have secured additional ground by bonding from G. Tbel's a half-mile strip adjoining their ground.

The Horseshoe, near Trout lake, has been sold to Philadelphia, Pa., men for \$16,000, says G. W. Stead, manager, who is also manager of the Ethel and Lucky Boy mines.

The Slocan Star Co., Sandon, intend to begin erection of a zinc concentrating, roasting and magnetizing plant next month. The Byron N. White Co. is applying for water rights on Sandon creek to furnish the necessary power. The company has a body of zinc ore blocked out which also shows silver values and contains a percentage of lead.

A strike of 4 feet of silver ore was uncovered on the Empress mine, near Bear lake, near Slocan City, last week. This mine is below the Silver Glance and owned by M. Vankirk.

The Lardeau Eagle says the English company operating the Nettle L. and Silver Cup mines, near Ferguson, have decided that greater profits can be realized by reducing the low and high grade ore at Ferguson, and will build a concentrator as soon as the sawmill can cut the necessary lumber. They will build an aerial tram from the lower terminal of the Silver Cup tram down to the forks of the Nettle L. road (which is across the river from Ferguson) where they will build the concentrator. At the same time another tram will be built from the Nettle L. mine. The concentrates produced will be shipped to the smelter.

The output of Rosland camp is increasing and shipments for the week ending May 16 and for the year to date are as follows:

	Week.	Year.
Le Roi.....	3360	70,194
Center Star.....	1830	31,678
War Eagle.....	1200	21,405
Le Roi No. 2.....	875	10,012
White Bear.....	80	267
Velvet.....	100	2,446
O. K.....	...	25
Giant.....	...	335
Kootenay.....	290	735
Homestake.....	...	90
Totals.....	7735	137,187

HONDURAS.

U. S. Consul W. E. Alger reports from Puerto Cortes, April 18, 1903: Honduras exported in 1902 metals to the value of 2,346,990.26 pesos (\$938,976). In 1898 the exportation only amounted to 1,501,114.18 pesos (\$600,445). The metals exported were: Gold, 23,235 ounces; silver, 1,010,204 ounces; copper, 25,198 ounces.

INDIA.

The annual report of the Nundydroog G. M. Co., Mysore, shows during 1902. treated 55,940 tons for 52,677 ounces of gold and 60,409 tons of tailings for 5357 ounces. The gold realized £218,170, a net amount of £207,332 after deducting royalty. The ordinary expenditure was £109,353. The report states that the Cauvery electrical power installation has proven satisfactory.

MEXICO.

CHIHUAHUA.

E. Baca of Parral is reported to have bought the San Vicente Ferrer mine,

near the La Prieta mine, owned by P. Alvarado.

DURANGO.

Austin, Texas, advices say the American S. & R. Co., through the Guggenheim Exploration Co., its Mexico branch, is reported to have bought the mines of the Descubridora M. Co., near Mapimi, for \$8,000,000 gold.

SONORA.

Manager W. E. Defty, of the American-Mexican M. Co., operating El Provedora de Cobre mine near Calera, near Caborca, in Altar district, says the tunnel is in 230 feet, and has cut the ledge, showing good copper values. A shaft has been sunk 75 feet, and from the bottom a drift run 57 feet in ore.

In Ures district, 15 miles east from Liano, the Mina Grande, El Progreso and San Ricardo mines, antiguas, are being developed by an Eastern company, of which T. F. Turner, of Canton, Ohio, is manager.

The pipe line of the Sonora Quartz Mines D. Co., to convey water from Cienega to the company's works at El Tiro, in Altar district, is finished.

NEW ZEALAND.

Six quartz mines in Otago, from which returns were obtained the past year, crushed 9178½ tons of quartz, yielding 6264 ounces of retorted gold, valued at \$23,826; and 1154 tons of tailings treated by cyanide yielded 234 ounces of gold, valued at \$768.

The Kirwan's Reward G. M. Co., which is quarrying from open face cuttings 30 feet in width on the Victoria Range, in Inangahua district, obtained 2548 ounces of gold last year, value \$10,268, from 3423 tons of ore. The milling capacity has been increased from ten to fifteen heads of stamps.

At the Barrytown Flat hydraulic sluicing claim during the past year 228,000 cubic yards were operated on for 710 ounces of gold, value \$2781 (5.9 cents per yard).

As showing the progress made in gold dredging in Southland during the past few years, it may be stated there are thirty dredges working at Gore, Waimumu, Chariton creek and Waikaka, and these machines require 230 men at work, says the New Zealand Mines-Record. There are two dredges at work at Waikaka, and four are building for the Fair-down, Garryowen, Nugent Wood and Hessey companies. The value of the gold won last year at Waikaka from dredging and sluicing was \$10,000. According to returns furnished the inspector of mines for Marlborough, Nelson and the West Coast, the dredges working in those districts had a total yield of 33,486 ounces of gold the past fiscal year.

Sixteen quartz mines in Marlborough, Collingwood, Westport, Lyell and Reefton districts crushed during the past year 107,871 tons of quartz, which yielded 52,633 ounces of gold, value \$212,150. The Progress mines of New Zealand, Reefton, crushed 55,976 tons, yielding 26,437 ounces; the Golden Fleece, 13,614 tons, for 7000 ounces; Wealth of Nations, 11,566 tons, for 5544 ounces; Keep-it-Dark, 11,405 tons, for 3800 ounces; Welcome, 1776 tons, for 1195 ounces. In Collingwood district the Golden Ridge and Ant Hill mines crushed 3442 tons, for 2223 ounces, and the Golden Blocks 2402 tons, for 2119 ounces. The Jubilee mine at Top Valley, Marlborough, crushed 644 tons, for 152 ounces.

PERU.

The northern part of the Peruvian coast contains coal, petroleum and naphtha. Coal is found in twenty-three provinces and the coal beds being in many places in close proximity to the sea, facilities for its exportation are offered. The principal sources of petroleum are found in the Department of Piura, where the production of each well may be estimated at 3590 to 3696 gallons per day. The petroleum contains little paraffin. The heavy oils are similar to those of Russia. The crude oil can be employed as fuel without other preparation than exposure to the atmosphere in open ponds for a few days.

Books Received.

"Reports of Mining Cases and Mining Statutes of British Columbia" is the title of a valuable volume, in unique morocco binding, by Justice Archer Martin of the Supreme Court of British Columbia. The work will prove of great interest and value to all interested in mining in that Province. Besides a historical review, the work contains reports of cases, a table of all the mining proclamations, ordinances and statutes and an interesting glossary of mining terms. It is the standard authority in mining law in British Columbia. The Carswell Co., Ltd., of Toronto, Canada, publishers.

PERSONAL.

R. D. GRANT of Salt Lake City, Utah, is at Portland, Or.

S. G. BENNETT of the U. S. Geological Survey is in San Francisco, Cal.

L. WALKER is superintendent of the Midway mine, near Sumpter, Or.

J. A. LARGENT of Salt Lake City, Utah, is in Montana on mining business.

C. PETERS of Tonopah, Nev., is in San Francisco, Cal., on mining business.

C. K. COLVIN of Denver, Colo., has returned there from Kansas City, Mo.

A. G. LAMSON returned to Salt Lake City, Utah, from an extended trip East.

J. N. KERR of the U. S. Geological Survey is in San Francisco, Cal., on business.

E. R. REED, interested in oil properties near Bakersfield, Cal., is in San Francisco, Cal.

R. C. WALRATH, interested in mines near Nevada City, Cal., is in San Francisco, Cal.

T. FLEMING, interested in mines at Tonopah, Nev., is in San Francisco, Cal., on business.

A. P. CHITTENDEN is superintendent of the Clio mine at Jacksonville, Tuolumne county, Cal.

W. FLOYD, a mining man of Saulsbyville, Tuolumne county, Cal., is in San Francisco, Cal.

R. ADDOMS has resigned as superintendent of the Alpine M. Co., Cove district, near Sumpter, Or.

W. W. WHITING, Denver, Colo., Western manager Diamond Rubber Co., is in San Francisco, Cal.

A. BLANC has returned to San Francisco, Cal., from a trip through mines in northern California.

J. H. NEALE, owner of the Neale and other pocket mines near Sonora, Cal., is in San Francisco, Cal.

M. SCHUMAN, a geologist of Germany, is making a study of the oil deposits around Kayak, Alaska.

H. L. MILLS, superintendent of the Wedge mine at Marysville, Utah, is in the East on mining business.

W. A. HEWITT, JR., of the Compressed Air Machinery Co. of San Francisco, Cal., has gone East on business.

J. F. CLAPP of Chicago, Ill., interested in Western mining properties, is in San Francisco, Cal., on business.

E. T. LOY, manager of the Minnesota mine, near Chloride, Ariz., is in Los Angeles, Cal., for the summer.

H. S. SHERARD, superintendent of the cyanide plant of the Quartette Co., near Searchlight, Nev., has resigned.

E. M. HAND, superintendent of the Watseca mine, near Rochester, Mont., has gone to New York on business.

E. DANIELL succeeds J. Wilson as head mining captain of the Hecia branch of the Calumet & Hecla at Calumet, Mich.

R. WHINNERAH of Denver, Colo., has gone to Breckenridge, Colo., as mill superintendent of the Mountain Pride mine.

T. E. HENEHAN and W. BURNS of Colorado Springs, Colo., are examining mining interests near Marysville, Utah.

T. T. LANE, formerly of Angels, Cal., is in San Francisco, Cal., from Parral, Mexico, where he is engaged in mining.

L. W. BORGER of Campo Seco, Cal., has taken a position as chemist with the Pacific Foundry Co. of San Francisco, Cal.

R. H. CHANNING, manager Utah Con. Co., with smelters at Murray, Salt Lake county, Utah, is in the East on business.

E. L. HOLLINGSHEAD, of the Weyant M. Co., of Toledo, O., returned to Weiser, Idaho, last week from an Eastern business trip.

F. PLANK, manager for the San Juan M. Co., in Lower California, Mex., is visiting in California from Guaymas, Sonora, Mex.

H. A. BOMBERGER, president La Gloria M. Co., returned last week to Philadelphia, Pa., from their mines near Phoenix, Ariz.

M. J. HUNNEBELLE of Paris, France, a director in the Gold Roads M. Co., near Kingman, Ariz., is in Salt Lake City, Utah.

J. A. CHURCH, consulting engineer for the Old Dominion C. M. & S. Co. at Globe, Ariz., and also for the Shannon

C. Co., near Clifton, Ariz., has returned to Globe from an extended visit to Clifton and Morenci, Graham county, Ariz.

G. GRAHAM and D. O'DONNELL, engaged in mining in Rhodesia, South Africa, are in San Francisco, Cal., en route to England.

N. C. BONNEVIE, of Bonnevie & Lee, consulting engineers, Denver, Colo., has returned from Gunnison county on mining business.

L. F. J. WRINKLE has resigned as instructor in the department of mining engineering at the Nevada State University at Reno, Nev.

W. J. RULE of Sonora, Cal., superintendent of the Belle mine near Tuttle-town, Tuolumne county, Cal., is in San Francisco, Cal.

E. M. HOLBROOK will resume management of the Horseshoe M. Co., near Deadwood, S. D., vice W. L. McLaughlin, manager pro tempore.

NORMAN A. ROOT will represent the Hallide-Henshaw-Bulkley Co. of San Francisco, Cal., in Portland, Or., and Seattle, Wash., after June 1.

E. H. WILEY, manager of the Big Creek M. Co., operating near Groveland, Tuolumne county, Cal., has gone to Maine to attend a director's meeting.

J. TERRELL of the Clement Syndicate, owning the Castle Peak mines, near Bodie, Cal., has returned to London, England, from a visit to the mines.

L. E. WILLIAMS, secretary and treasurer of the King Verde G. & C. Co. of Glenwood, Iowa, is visiting their mines at Quartzsite, Yuma county, Ariz.

A. MIDDLEBROOK, manager Denver branch Jeanesville Iron Works Co., manufacturers of mine pumps, has returned from a business trip to Arizona.

O. C. WRIGHT of Van Vleet & Wright, and president of the Blue Bird M. Co., returned to Sumpter, Or., last week from a trip to New York on mining business.

C. J. MOORE returned to Cripple Creek, Colo., last week from an extended trip to northern Nevada and to the La Salle mountains of Utah, examining mines.

P. SCHABARUM, manager for La Dura M. Co., whose mines and works are at La Concentracin and La Dura, Sonora, Mex., has gone to Germany on a visit.

A. W. JENKS, until recently manager of the Minera de Penoles mines at Durango, Mex., is manager of the White Knob copper mines at Mackay, Idaho.

BAILEY WILLIS, formerly of the United States Geological Survey, has been appointed to the Carnegie Institute, and will go to China for geological investigations.

PRESIDENT P. A. H. FRANKLIN of the Franklin M. Co. has returned to Salt Lake City, Utah, from the mines of the company at Marysville, Piute county, Utah.

J. W. DOUGLAS, of the Standard Marble Co., operating east of Bossburg, Wash., returned to Spokane, Wash., last week from a three months' trip to Boston and New York.

A. J. STEVENS, president, and A. I. Richardson, manager, of the Black Mountain M. Co., are at the mines of the company in Silver Creek, near Kingman, Ariz., from Los Angeles, Cal.

H. F. BAIN, former assistant manager of the Independence Con. mine, Cripple Creek, Colo., will have charge of the editorial work of the geological folios of the U. S. Geological Survey, Washington, D. C., vice B. Willis resigned.

Commercial Paragraphs.

J. H. ADAMS, of San Francisco, Cal., started for Nome via Seattle, Wash., on the 23rd inst. He takes with him three Adams hydraulic lifts, two giants and the necessary gates, pipes, etc., for two complete plants.

THE Stillwell-Bierce & Smith-Vaile Co. of Dayton, Ohio, write the Yankee Con. M. & M. Co. at Yankee, Colo., are installing a Stillwell feed-water heater in their new steam power plant which will operate the mill they are building.

THE Ironsides Co., Columbus, Ohio, reports the business of its past fiscal year, just closed, as showing a gratifying increase, with favorable prospects for a further enlarged business in the coming year. The company manufactures and supplies special lubricants for wire ropes, fiber ropes, gearing and belting, a line of

paints for metallic surfaces, and the Ironsides improved car wheel roller.

BROWN CORLISS ENGINE CO., of Corliss, Wis., writes that H. R. Cornelius of Pittsburgh, Pa., for a number of years direct representative of the Southwark Foundry and Machine Co. of Philadelphia, Pa., has entire charge of the output of the Brown Corliss Engine Co., in Pittsburgh district, and has opened up offices in the Frick Building.

THE Burnham-Standford Co. of Oakland, Cal., report shipping ten portable houses to Carmel-by-the-Sea, Monterey county, Cal. The demand for buildings manufactured by this company has grown rapidly within the past three years. A new 24-page catalogue, with illustrations, showing many new and attractive styles of these portable buildings, will be mailed on request.

Obituary.

M. KOPP, formerly interested in mining in Tintic and West Tintic districts, Juab county, Utah, died at Salt Lake City, Utah, on the 18th inst., aged 48 years.

J. WALL, a pioneer miner of Montana, a resident of Basin, Jefferson county, died on the 17th inst. in Helena, Mont., from a complication of diseases, from which he had been suffering for the past year. He owned an interest in the Saturday Night and Standard mines and some property in Basin. Deceased was born in County Antrim, Ireland, in 1847, and is survived by a widow and one son, in Brooklyn, N. Y., and a brother, in Butte, Mont.

Catalogues Received.

The Stillwell-Bierce & Smith-Vaile Co. of Dayton, Ohio, have issued catalogue No. 53, descriptive of their pumps, water heaters, compressed air machinery, etc. It contains over 100 handsomely printed pages, with many superb illustrations of their various types of machinery.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MAY 19, 1903.

- 728,614.—FLOOR SCRUBBING DEVICE—M. C. Bliss, New Whatcom, Wash.
- 728,360.—FISHING SPOON—C. F. Breidenstein, S. F.
- 728,678.—TIRE—L. C. Cummings, Pasadena, Cal.
- 728,375.—DENTAL VULCANIZER—C. A. Davis, Pasadena, Cal.
- 728,680.—ARTIFICIAL FUEL—J. T. Davis, S. F.
- 728,562.—SAW FILING, GAUGE—S. J. Galloway, Hillsboro, Or.
- 728,702.—REFRIGERATOR—George & Rademacher, Los Angeles, Cal.
- 728,391.—EXCAVATOR—Grant & Shears, Los Angeles, Cal.
- 728,393.—WATER WHEEL BUCKET—G. J. Henry, Jr., S. F.
- 728,803.—SEED PLANTER—P. Le Sueur, Calabasas, Cal.
- 728,493.—BED—T. L. Mahoney, S. F.
- 728,463.—CARRIER—McGehee & Lathwesen, San Jose, Cal.
- 728,404.—CARTON—McGehee & Brower, San Jose, Cal.
- 728,487.—HYDRAULIC CLASSIFIER—C. W. Merrill, Alameda, Cal.
- 728,752.—ELECTRICAL APPARATUS—Naphtaly, Jones & Varney, S. F.
- 728,756.—LOCK AND LATCH—M. C. Patrick, Seattle, Wash.
- 728,415.—CUFF HOLDER—W. T. Robinson, S. F.
- 728,419.—BALL AND SOCKET KNUCKLE—S. A. Scheelenger, Gridley, Cal.
- 728,811.—LEVER VEHICLE—J. Scott, S. F.
- 728,314.—ROCK DRILL—V. Y. Smith, Globe, Ariz.
- 728,423.—FLOOR SURFACER—Spence, Prugh & Zimmer, Oakland, Cal.
- 728,337.—GAME—C. Tanron, S. F.
- 728,621.—CLUTCH—E. Turney, Portland, Or.
- 728,534.—SHIPPING CASE—C. R. Walter, S. F.
- 728,527.—HEATING STOVE—J. H. Waters, Tacoma, Wash.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

HYDRAULIC CLASSIFIER.—No. 728,487. C. W. Merrill, Alameda, Cal. This invention relates to an apparatus which is especially designed for separating the heavier or coarser from the lighter or finer components found in tailings of ores or other valuable products, these separations being technically known as "concentrating" and "classifying." It consists of a closed downwardly convergent receiver with a central discharge opening at the bottom, a centrally located supply opening at the top, a water chamber surrounding said opening and having a sloe supply opening and a bottom slotted to form a continuous channel opening into the receiver near the inner periphery of said receiver, and a source of supply connecting with the opening at the top of the receiver.

Latest Market Reports.

SAN FRANCISCO, May 29, 1903.

METALS.

SILVER.—Per oz., Troy: London, 24½d (standard ounce, 925 fine); New York, bar silver, 53½c, refined (1000 fine); San Francisco, 53½c; Mexican dollars, 42½¢; 42½c San Francisco, 42½c New York.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50@14.75; Electrolytic, 1 to 3 casks, \$14.50@14.75; Casting, 1 to 3 casks, \$14.50@14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £61 7s 6d spot per ton.

Copper shows no material change and the market is described as dull, there being nothing unusual in either supply or demand. The demand for copper has largely increased the past few years, but the output has increased proportionally, due to the opening of new Western mines and increased output of old ones.

LEAD.—New York, \$4 37½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £11 12s 6d per long ton=2.75c per lb.

SPELTER.—New York, \$5.75; St. Louis, \$4.60; London, £20 17s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 100-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$28 45@28 65; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32c; bar tin, 3½c, 35c @37½c. London, £129 15s spot.

PLATINUM.—San Francisco, crude, \$18.00 @ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$44.50@46.00; large lots, London, £8 15s; San Francisco, local, \$45.00 @ flask of 76½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.75c.

NICKEL.—New York, 50@60c @ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$19.75 @20.25; gray forge, \$19.85; San Francisco, bar, 3c @ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$31.50; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

NAILS.—Per keg (list prices): No. 20d to 60d, Wire, \$3.25; Cut, \$3.35; 10d to 16d, Wire, \$3.35; Cut, \$3.35; 8d, Wire, \$3.40; Cut, \$3.40; 6d and 7d, Wire, \$3.50; Cut, \$3.50; 4d and 5d, Wire, \$3.60; Cut, \$3.60; 3d, Wire, \$3.75; Cut, \$3.75; 2d, Wire, \$4.00; Cut, \$4.00. Special rates for carload lots.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2*, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 725 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$3; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c @ set; 14 oz., 40s., 9½c.

CEMENT.—Germania, \$2.50 @ 2 75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, 4c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26c @ lb.; carloads, 23@24½c; in tins, 35c; soda ash, \$2.00 @ 100 lbs.; hyposulphite of soda, 2½@2½c @ lb.; caustic soda, in drums, 3@4c @ lb.; Cal. s. soda, bbls., \$1.25@1.50 @ 100 lbs.; sks., \$1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb. tins; borax concentrated, 7@8c @ lb.; roll sulphur, 4@6c; powdered sulphur, 2@3c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2@2½c; sulphide of iron, 9c @ lb.; copper sulphate, 5@7c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 2½c @ lb.; nitric acid, in carboys, 8c @ lb.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50 Brymbo, \$7.50; Pennsylvania, hd., \$14.00 Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb powdered, 9@12c; fused, 25@30c.

BORAX.—Crystal, 7c; calcined, 25c.

COPPER.—Sulphate, 5@7c.

MANGANESE.—Pure, 3½ lb., 60c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

BISMUTH.—Subnitrate, per lb., \$1.60.

SODIUM.—Metal, 3½ lb., \$1.00.

MERCURY.—Bichloride, 3½ lb., 90c.

PHOSPHORUS.—(American) 3½ lb., 75c.

SILVER.—Chloride, 3½ oz., 90c@1.00; nitrate, 55c.

ALUMINUM.—No. 1, 99%, small lots, 37c @ lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, 3½ lb., \$3.50.

ZINC.—Metallic, chemically pure, 3½ lb., 50c; dust, 3½ lb., 10c; sulphate, 3½ lb., .04c. (These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

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ANNUAL MEETING.

The Regular Annual Meeting of the Stockholders of the National Cons. Mining Company will be held at the office of the company, 773 Mission St., San Francisco, California, on MONDAY, the 1st day of June, 1903, at the hour of 8 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the meeting.

GEO. W. FLEISSNER, Secretary.

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CONTENTS: Chapter I. Sheepskins. II. The Manufacture of Chrome-Tanned Sheep Leather. III. Sheepskins: Alum, Oil and Napa Processes. IV. Wool Skins: The Tanning of Shearings, Sheep Pelts for Mittens, Rugs and Similar Purposes. V. Sheepskins: Bark Extract and Chamolins Tanning. VI. Goatskins: Beamhouse Work, Preparing the Skins for Tanning. VII. The Chrome Tanning of Goatskins. VIII. The Finishing of Chrome-Tanned Goatskins into Colored and Black, Glazed and Dull Leather. IX. Dogskin and Indian-Tanned Goat and Sheepskins. X. Patented Processes of Tanning and Tawing. XI. Deerskins. XII. Patented Methods of Deplucking. XIII. Patented Processes of Bating. XIV. The Manufacture of Calfskin Leather. XV. Calfskins and Chrome Processes. XVI. Calfskins: Vegetable and Combination Tanned. XVII. Calfskins Tanned for Glove and Mitten Purposes. XVIII. Tanning Furs and Hairskins. XIX. Kangaroo Leather. XX. Methods of Bleaching Leather. XXI. Preparing Heavy Hides for Tanning. XXII. Side Leathers for Shoe Purposes and Methods of Tanning Them. XXIII. The Coloring, Fat-Liquoring and Finishing of Hemlock, Gambier, Palmetto, Quebracho and Combination-Tanned Sides into Shoe Leather. XXIV. Horsehides and Coltskins. XXV. Harness, Liner, Strap, Belt, Bag, Case, Laces and Russet Leathers. XXVI. Miscellaneous Information. Appendix. Beamit, One-Bath Beamhouse Process. Index.

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15x9x12 Snow Underwriters' fire pump.
18x12x10 Worthington standard duplex.
10 & 15x10x10 Worthington compound duplex.
8 & 12x10x10 Worthington compound duplex.
15x8x10 Worthington standard duplex.
7x4x6 Worthington.
14 & 20x5x18 Worthington compound.
5x5x5 Worthington.
6x4x6 Worthington.
4x4x24x4 Worthington.
5x4x3x6 Worthington.
8x2x8 Worthington.
4... H. T. Davidson No. 10 pumps with Fisher governor, suction 7 in. discharge 6 in.
10x12x12 Dean duplex.
Silshy rotary fire pump.
5x4x5 Knowles single acting.
8x6x10 Holly single.
7x4x7 Crane.
7x4x7 Canton duplex.
14x7x12 Dean single.
12x6x18 Norwalk.
8x5x10 Gaskell.
7x4x10 Smedley.
5x4x14x6 Blake duplex.
5x10x12 Warren-Webster vacuum.
10x20x18 single direct acting.
No. 2 Buffalo jet condenser complete with air pump and receiver up to 250 H. P.
50... Boiler feed pumps.

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2... 12 in. Morris submerged.
No. 4 Morris horizontal with friction pulley.
No. 12 belt driven Morris Machine Co.'s sand pump. 14 in. suction; 12 in. discharge.

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Air Compressors.

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14x14x18 Ingersoll-Sergeant class "H" straight line.
18x18x30 Ingersoll-Sergeant class "H" straight line.

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Standard black wrought iron pipe, second hand; sizes from 3/4 to 12-inch. CASING of all sizes. We can save you money on pipe. Write us your wants.

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A stock of good second-hand cable from 3/4 to 2 1/4-inch.

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12... 35 gauge "Western"
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Ingersoll "A" Cylinder 1 1/2 in. diameter.
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" " " " 3 " " "
" " " " 3 1/2 " " "
" " " " 4 " " "
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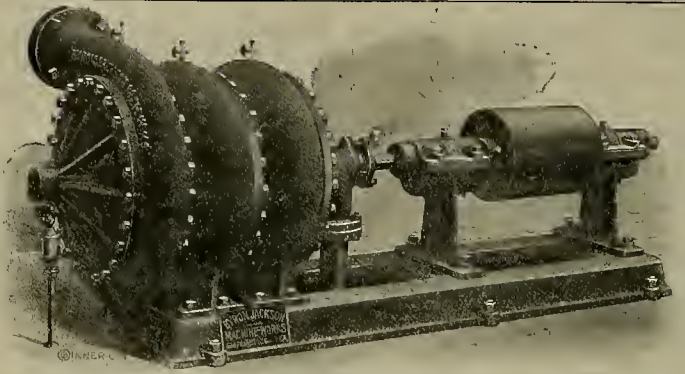
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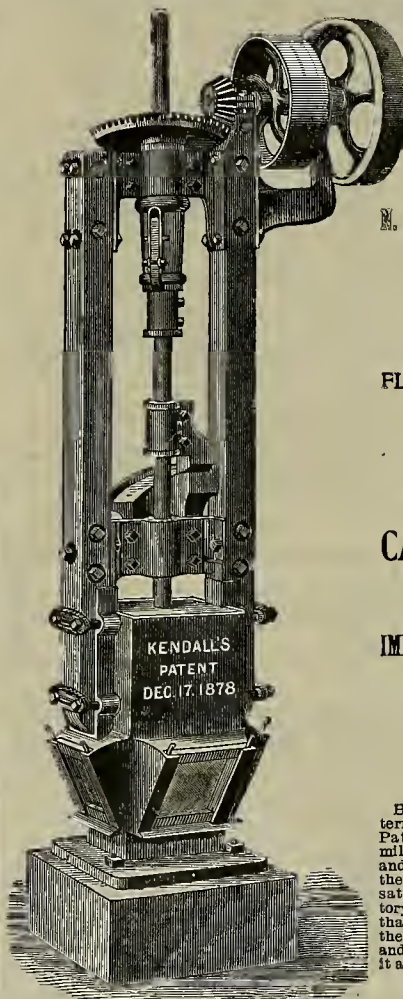
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Skips vs. Cages.

The announcement that the Portland Company at Cripple Creek, Colo., have discontinued the use of cages in their main shaft in favor of skips is another indication of the increasing favor in which this method of ore handling in mines is viewed. By the cage system, employing two or three "decks," a large tonnage can be hoisted daily, and there are other advantages, as in the handling of men and materials. It also renders the construction of ore bins beneath the stations unnecessary, and at first thought one would be inclined to give the preference to the cage system; but long experience and observation by mining engineers, who consider every branch of their business, and who carefully weigh the cost of every item of the expense account, show that skips can handle ore less expensively than cages where the hoisting plant is of the same capacity. Although the employment of skips necessitates the construction of ore bins and gates below each station at the cost of several hundred dollars for each bin, there are advantages in favor of the skips which cannot be denied. Ore may be trammed as rapidly as the stopes can supply it, and the trammers may dump the cars into the bin beneath the station, and return immediately to the chutes to reload. Should the ore accumulate in the bins more rapidly than it is drawn into the skips, so much the better, as it affords a supply upon which to draw should there be a stoppage in stoping from any cause. If all the waste broken in the mine is not utilized in the mine for filling, the bin beneath the station may be divided by a partition, and, when necessary, waste may be dumped on one side and ore on the other. One of the chief advantages in the use of skips is the saving of time of trammers at the shaft. The carman does not have to wait for a skip, nor has the skip tender to wait for ore—generally speaking, though exceptions have been noted.

In mines where there is a considerable volume of water to be raised to the surface, it has long since been demonstrated that skips can remove the water more economically than by pumping. For this purpose skips of large size may be used. The first cost of the plant is but a small fraction of that of a heavy pumping plant, and the cost of power is much less than with pumps. Skips are always ready in case of emergency, such as an unexpected influx of water,

and the hauling capacity may be increased by placing in larger skips or running more rapidly, or a combination of both. A skip of three tons capacity is not abnormal in size; in fact, in some mining districts, it is considered under average size. There are few cages hoisting more than three tons at a load. Both skips and cages may be run in balance, so there is no advantage to either in that respect; but, for general utility and economy, skips are preferable to cages for shafts of any inclination, while cages cannot be run to advantage on shafts having less than a 65° pitch. As to rapidity of running, a skip may be run as rapidly as a cage, and both slide in guides in vertical shafts; but in inclines where skips are in use, the skips run on wheels and a guard rail should be provided to prevent derailment when running at high speed. Where skips are employed for hauling water, valves placed in the bottom are necessary, and these should be protected by some device which will break the force of the blow when the skip strikes the water. In the sump it is absolutely necessary to have a guard to prevent the skip leaving the track when the skip strikes the water, for there is always a tendency for the skip to be lifted from the rails if the engineer does not lower slowly upon approaching the surface



New Head Frame Mizpah Mine, Tonopah, Nevada.

of the water. A number of devices for this purpose were recently shown herein in an article on unwatering mines in the anthracite regions of Pennsylvania.

A New Steel Head Frame.

The accompanying illustration is that of a steel head frame recently constructed over the main shaft of the Mizpah mine of the Tonopah M. Co. of Tonopah, Nev. While the design does not fully meet the ideas of the most modern head frame construction, for use under similar conditions, it will undoubtedly meet every demand that may be made upon it. Furthermore, it is an indication of the progressive and enterprising spirit that prevails in the new Nevada mining camp. There are many old mining camps where steel head frames are not yet considered a necessity. In central Nevada, however, there is no timber of any description, not to mention that suited to the construction of head frames, consequently a steel frame is but slightly more expensive than one of timber would be under the existing conditions. The new steel frame has been built over the old wooden frame, which also shows in the illustration. In some instances where it is planned to sink a deep shaft and to eventually install a heavy head frame and large hoisting plant, the temporary hoist is located at one side while sinking in order that the contemplated heavy construction may be interfered with as little as possible. Ten years ago steel frames were an innovation in the United States, but they are becoming common now, and in the future, when the relative cost of steel and wooden frames is not widely different, it may be anticipated that steel frames will be preferred and built. Designs may also be expected to change from those commonly employed in wooden frames, though wooden frames may be built on the same lines as steel frames.



Copper River, Alaska. View Looking Down Stream Above Bremner River. (See page 365.)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
New Head Frame Mizpah Mine, Tonopah, Nev.....	360
Copper River, Alaska.....	360
A Surf Washer for Beach Sands.....	364
Mining and Metallurgical Patents.....	365
Electric Chain Mining Machine.....	366
Air Chain Mining Machine.....	366
Electric Chain Mining Machine With Frame Partly Under Coal.....	366
Notes on Automatic Ore Sampling.....	367-368
Perrigo Mill, Gilpin Co., Colo.....	370
Battery and Shaking Table, Perrigo Mill, Colo.....	370
EDITORIAL:	
Skips vs. Cages.....	360
A New Steel Head Frame.....	360
Why the Prospector Sells.....	361
The Concentration of Ores.....	361
The Legislative Day.....	361
MINING SUMMARY.....	370-371-372-373-374
LATEST MARKET REPORTS.....	375-376
MISCELLANEOUS:	
Concentrates.....	362
Ore Deposition and Vein Enrichment by Ascending Hot Waters.....	363
Coal Industry in British Columbia.....	363
Beach Mining With a Surf Washer.....	364
Some Notes on Iridium.....	364
Mining in Bendigo.....	364
Copper River District, Alaska.....	365
Mining and Metallurgical Patents.....	365
Chain and Pick Coal Cutting Machines.....	366
Gold Mining in Siberia.....	367
Annual Meeting of American Institute of Electrical Engineers.....	367
Notes on Automatic Ore Sampling.....	367-368
Practice of Quartz Milling on the Rand, South Africa.....	369
Assaying Cyanide Solutions.....	370
California Polytechnic School.....	370
A Revived Mining District.....	370
Catalogues Received.....	374
Obituary.....	374
Personal.....	375
Books Received.....	375
Commercial Paragraphs.....	376
New Patents.....	376
Notices of Recent Patents.....	376

Why the Prospector Sells.

The prospector or claim owner who offers his claim for sale is not infrequently asked, "If your claim is so good why do you not work it yourself?" This seems a pertinent question, but is it? The man who has the grit to shoulder his blankets, tools and little store of "grub" and goes out into the wilderness of mountains, or trudges wearily over broad stretches of desert sand deserves success, and he is often rewarded. When he "packs his kit" he goes with the hope of finding something, and usually with the intention of selling it if he succeeds. As this has been his purpose from the outstart it is not strange that he should return to civilization loaded down with specimens of his find, nor is it curious that he should offer for sale that which he believes to be valuable. He has no capital to equip and work it himself, and in many cases would not know how, if he had the means and disposition to do so. Most men who are in business know nothing of the experiences and misfortunes, the joys and disappointments of the mine hunter, but they are usually anxious to sell to advantage whatever they may have that is salable, whether real estate, merchandise or knowledge, yet nothing is thought of it. So the prospector when he has found a good vein hastens to the money market to sell that which is his capital or stock in trade. Many good bargains have resulted between prospector and buyer—good for both the miner and capitalist. The principal difficulty that the prospector encounters in the endeavor to realize on his find is the exaggerated value he places on a prospect. Ordinarily he calculates the amount of money he can conveniently use before he dies, and whatever sum strikes his fancy is the price he puts upon the mine, but this figure does not always harmonize with the ideas of the investor, who is inclined to look into the proposition with a view to getting his money back some day. The frequency with which the investor fails to do this shows that it is necessary to investigate any "bargain" in the way of a mining claim

fully before paying out cash. Under most circumstances there is little trouble in selling a good well-developed mine—one which upon examination shows good pay—but there is often some difficulty, and occasionally more or less disappointment, in attempting to dispose of poor property. The prospector is indispensable to the advancement of mining, but the prospector does not represent a class of men who successfully operate mines. There are three classes of men required to make a success of mining—the prospector to find and partially develop the mine; the capitalist to equip and fully develop it; and the trained, practical miner to manage and operate it. In this combination lies success. Occasionally all three of these are found in a single man, but he is comparatively rare.

The Concentration of Ores.

All branches of metallurgy are advancing and improvement is being made frequently in processes long in use. New methods, too, are being given consideration; but in no branch of metallurgical science has such advancement been made as in concentration of ores. There are many districts where the high-grade ores have been worked out, and now nothing remains but low-grade sulphide ores. In other districts only low-grade ores are found. In either case the low-grade ores are unprofitable, or only profitable to a limited extent, unless they can be concentrated economically and the resulting sulphide mineral treated by one of the several processes by means of which the values may be extracted. There are some peculiar notions and prejudices prevalent, the result of years of practice; but the modern, up-to-date metallurgist realizes that some of these time-honored methods are not the best or most successful; but it is often difficult to overcome this prejudice in favor of long-used methods, even though it be known that such methods do not give the highest attainable results. Many ores can not be treated by a single, simple process. Some ores which for years were treated by amalgamation only are now amalgamated, the pulp concentrated and the tailings cyanided, and the values remaining after this series of treatment are commercially valueless.

The Homestake mine, in South Dakota, is an example of this. In the early history of the mine the ores found at and near the surface were as free-milling as could be desired. The gangue was quartz with hematite, the iron oxide representing the oxidized sulphide since found in depth. As the development of the mine proceeded downward, the sulphides gradually replaced the oxidized ores, though at one place the red ore extended to a depth of 400 feet. With the appearance of the sulphides the values in the tailings commenced to run up, augmenting with the increasing quantity of sulphides. The sulphides, almost wholly iron, were considered too low grade to ship to distant smelters, there being no smelters other than those adapted to the treatment of lead ores in the Hills at that time. The chlorination process was not tried there and the practical application of the cyanide process was unheard of up to 1887. However, the management, reasoning rightly, that in time the sulphides might prove valuable, attempted a rude concentration of the tailings by passing them over strips of Brussels carpet. Two "blanket houses" were built, each over 300 feet in length, the tables in each of these houses having a different grade, though the result was not materially different. The tables were narrow—about 28 inches wide—to accommodate the carpets, which were laid in long strips. Over these the pulp was run, there being several strips in each plant. When the tailings had run a given time over the "blankets," as they were called, the pulp was turned into the other sluices, and, without cleaning by running clear water over them, the carpets were taken up in sections, loaded in a wheelbarrow and wheeled to a tank at the lower end of the building, where they were washed. This was done by placing the carpet on one of two cross bars over the open tank. The end was passed under water and laid upon the second bar. Fold after fold was treated in this manner, and when finished the carpet was wheeled back and replaced in the sluice, still carrying about 20% of its original load. When all the sections of carpet in the long sluice had been washed in the manner described and replaced in the sluice, the stream of pulp was again turned on and

another sluice cleaned up. For years this practice continued, resulting in the accumulation of large quantities of low-grade sulphides containing about 40% silica.

The large amount of low-grade sulphide concentrated on the carpets were sold to the pyritic smelter at Deadwood several years ago, and for some time the Homestake company disposed of all their concentrates in this manner.

Notwithstanding their precautionary measure of blanket concentration, the value of the Homestake tailings continued to increase with greater depth of the mine workings, until the tailings were worth \$1.50 to \$2 per ton, and millions of tons of material of this value passed down and lodged along the streams into which the mill races drained, the deposit being carried for miles. Since 1878 these great mines have daily sent down the streams leading from the mills from 2000 to 3000 tons of sand—at an average of 2500 tons per day, an aggregate of over 20,000,000 of tons. In the later years, as above stated, these tailings contained considerable values, and they are now being treated at various places, it is claimed, with success. The Homestake Co. has within the past few years adopted the latest ideas in metallurgical practice and the tailings are now only worth a few cents per ton, and an effort is being made to reduce this small loss still further. Elsewhere concentration has been developed on an elaborate scale. Among the numerous schemes for concentration may be mentioned: Single, crushing to a given mesh, and single concentration on a table or belt machine, crushing and concentration and further separation by the electro-magnetic separator, as applied to the separation of zinc sulphide from iron, lead and copper sulphides. A third method is crushing and concentration with reconcentration of middle product.

In the concentration of sulphides in gold ores, containing only a small percentage of sulphide material (less than 5%), good results are usually produced by passing all the pulp from a 5-stamp battery over a shaking table; tailings to hydraulic classifiers, with elimination of valueless coarse sands, and fines to belt concentrator. If values still remain, which no adjustment of the concentrating machines or classifier can remedy, the tailings from the belt machine may be further treated by passing over a canvas plant, with or without a classifier between the belt and the slimes table. It is good business to continue to concentrate as long as the result is profitable, but no more operations should be carried on than are necessary to insure commercial success.

The Legislative Day.

An unfortunate phase of the present labor situation is an increasing distrust in the outcome of all the agitation. Mines are idle and would-be investors are withholding their financial support from new or contemplated mining enterprises for the fear that further demands may be made by miners' unions, which the value of the ores would not admit. Mining is usually carried on for profit, but when no profit is discernible capital seeks other channels than mining for investment. One of the most unfortunate things in the labor situation is legislative interference in the matter of fixing hours for labor. In Western Australia the legislative body has even fixed the wage rate, and it is said that only a few of the richer mines can afford to pay the State scale of wages. In Arizona mine operators have undertaken to evade the eight-hour law by offering to pay men by the hour on a basis of 35 cents per hour, but that this will prove mutually satisfactory is doubtful, for there is a penalty for employing men more than eight hours during any twenty-four, though the workman may be willing to work "overtime." On the whole, perhaps, the most satisfactory manner of harmonizing the differences between employer and employee is by the contract system, but in some districts where demands have been made for shorter hours and increased pay the unions have decided that no contract work shall be permitted. An instance of this may be found at Tonopah, Nevada. The idea seems to be to get all the money possible for the least hours possible, and at the same time to secure all the work possible to the greatest number of men under these conditions. To this end the present method of operating on the part of labor organizations certainly tends, not only in the mining industry, but in other industrial and commercial branches as well.

CONCENTRATES.

THERE is no known method of annealing high manganese steel.

"CAPLE" is a Cornish name for granite which has a peculiar mottled appearance due to metamorphism, and is found as an accompaniment of tin-bearing veins.

AT present silver quotations the mint seigniorage on a silver dollar is 51.815 cents. Silver 53½ cents an ounce, 371½ grains (the amount in a silver dollar), is worth 41.185 cents as a commodity.

A COLUMN of water 1 foot in height gives a pressure of 0.433 pound per square inch at the base. A water column in a mine 1000 feet deep gives a pressure of 433 pounds per square inch at the pump, when the water is not flowing.

BEAUTIFUL, FINE, CLEAR, RED, CRYSTALLIZED SPECIMENS OF REALGAR (sulphide of arsenic) are sold by Eastern mineral dealers at from \$5 up. They come from the Hartz. Crystallized realgar specimens are not found in the United States.

THE rock samples from Grave, Oregon, are evidently the result of silicification of a dike rock, probably felsite. It is difficult to distinguish between siliceous felsite and chert from limestone. The rock contains iron sulphide and may be gold-bearing also.

THE Field Columbian Museum of Chicago owns the finest collection of Breckenridge Colo., free gold specimens known. Some beautiful crystallized specimens are in the collection. There are many specimens of wire gold. The collection is valued at \$25,000.

THE finds of native silver in connection with the native copper ores of the Lake Superior region are becoming scarcer each year. At times masses of native silver weighing a hundred pounds or more have been found. No mineral cabinet is complete without one or more of these specimens.

THE rock from the Bell Ranch, San Miguel county, N. M., is evidently the result of alteration of limestone. It contains a large percentage of calcium carbonate, with iron oxide and a little manganese oxide. Not particularly valuable unless it contains precious metal for which it was not tested. This should be determined by assay.

CONDENSING engines require from twenty to thirty times the amount of the boiler feedwater, for condensing purposes. An approximation, for estimating purposes, is one and one-quarter gallons condensing water per minute per indicated horsepower. It is usually estimated that a condenser will decrease the fuel consumption by from 20% to 25%.

THE American standard boiler horsepower as adopted is: Thirty pounds of water evaporated per hour at a boiler pressure of seventy pounds, the temperature of the feedwater being 100° Fahrenheit. For example, a boiler evaporates 300 pounds of water per hour, boiler pressure seventy pounds, feedwater 100° Fahrenheit, then the boiler would be $300 \div 30 = 10$ H. P.

NATIVE ARSENIC is but sparingly found in the United States, a small quantity having been found in Maine and New Hampshire. No good specimens have ever been found. The silver mines of the Hartz, in Germany and Austria, produce massive specimens of native arsenic. Native arsenic is tin white in color and a very heavy metal. On exposure to the air it quickly tarnishes to dark gray.

THERE exists a big demand for high-grade graphite mines, and, in fact, low-grade ore finds a ready market. The high-grade material is very scarce in the United States, but few are in operation and the production is very limited. High-grade graphite is necessary in the manufacture of lead pencils, crucibles, etc. Low-grade ores are used in the manufacture of pigments, lubricants, etc.

THE expedient of crushing gold quartz through a coarse screen in a stamp battery and the subsequent grinding of the granulated rock in rotary mills has been accomplished successfully. It usually results in increased capacity of the plant, if not in lower grade tailings. In some mills where the rock coming from the mine consists of a large amount of soft, slaty material, rotary mills have been used to advantage.

A "STOPE" is an excavation resulting from the removal of ore from a vein or deposit. It is usually understood to mean an excavation above a drift or tunnel. When the excavation has been made downward, beneath the level or drift, it is called an "underhand stope." The use of the term "stope" to indicate a mass of ore blocked out by development work, but not yet removed, is a misnomer, and an improper application of the term.

THE finest specimens of celestite (strontium sulphate) in the world are found in Strontian island, Put-In-Bay, Lake Erie. They are beautifully crystallized and blue

ish color. Witherite (barium carbonate) is found crystallized in repeated twins, color white, yellow and gray. Witherite specimens all come from England, and it is a peculiar fact that the United States has produced no witherite specimens of value, a few having been found in Kentucky and in Lake Superior.

A 1½-INCH round steel rope, weighing two pounds per foot and with a breaking strain of 84,000 pounds, should sustain itself with a length of 42,000 feet before breaking from its own weight. Taking the usual factor of 7, then the safe working length of such a rope would be 6000 feet. If a weight of three tons is hung on the rope, equivalent to a loaded cage, the maximum length at which such a rope could be used, with a factor of safety of 7, would only be 3000 feet.

THE question is not so much the grade of the ore as the quantity of it and the ability to treat it at a profit. Even if the ore does go but \$3 per ton, there are numerous prominent examples of big profitable mining properties where the ore averages much less, yet they pay big dividends. This is made possible by the amount of the ore, the skill of the producers and the economical methods of handling. There is profit in \$1 gold ore and in 1% copper ore under favorable conditions.

THE horse power, the quantity of work required to raise 33,000 pounds 1 foot in one minute, denoted by the symbol H. P., is referred to now as the mechanical horse power, with a symbol written M. H. P., to distinguish it from the electrical horse power, or kilowatt, for which the symbols E. H. P. and K. W. are employed. The electrical horse power is a mechanical horse power multiplied by 1.34048. Electric generators are estimated in kilowatt units and electric motors in M. H. P. units.

IN the zone of oxidation of the Broken Hill mines of New South Wales there are large amounts of black oxide of manganese. These oxides are presumed to be the result of alteration of rhodonite and manganese silicate, which occurs abundantly in the sulphide zone. As a probable intermediate product of this alteration there occurs in isolated places rhodochrosite (manganese carbonate) near the sulphide zone. The abundant occurrence of rhodonite in the sulphide zone makes concentration more difficult than it would otherwise be.

AT the smelters of the Mount Lyell Copper Co. in Tasmania it was found that with straight pyritic smelting from seven to twelve days was as long a run as could be made on an ore mixture containing 20% of an acid aluminous schist, but treating Mount Lyell ore alone the time of campaign would be much extended. With the former mixture the addition of 1800 pounds of coke to the furnace during each twentyfour hours (less than 1% of the charge), as certain symptoms appear, is sufficient to extend the campaign to forty days, and it might be much longer if it were not for careless feeding when much fine material is sent to the smelter.

CASSITERITE is oxide of tin. It has a gravity of 6.8 to 7.1, and may be readily concentrated. It has an adamantine luster. The color is brown, black, red, gray, white or yellow. The pulverized mineral is whitish, grayish or brownish, often pearly in luster. Nearly transparent to opaque. Occurs in dikes of coarse-grained granite and in veins of black fine-grained tourmaline; usually in granitic rocks. Cassiterite is insoluble in acids excepting concentrated sulphuric acid. It is easily reduced to metallic tin when heated on charcoal with soda. Without soda the natural oxide of tin is infusible.

CO-OPERATION in mining or building a smelter or other plant is an excellent idea, theoretically, and often works all right, but it must be borne in mind that there is no particular advantage about co-operation that will enable anything worked under that plan to avoid or escape the adverse conditions that may arise. The right kind of ore for the smelter; the ability to run it at a profit; the power to suit the customers and the knowledge to successfully meet changing conditions are points in the business that are not covered by co-operation any more than by monopoly, or individual enterprise. The question of profit or success lies outside of the manner of ownership.

TO FIGURE out the power required to hoist a load up an inclined plane, the first thing is the load on the engine. In an inclined shaft, 200 feet long and with a vertical depth of 150 feet, multiply the weight of ore, car and rope in pounds by the depth of the shaft in feet and divide by the length; weight 2000 pounds; $2000 \times 150 = 300,000 \div 200 = 1500$ pounds, the weight on the engine. The horse power is found by multiplying the weight in pounds by the speed of hoisting in feet per minute and dividing by 33,000. If the load is lifted at 200 feet per minute in the example, $1500 \times 200 = 300,000 \div 33,000 = 9.1$ H. P. To allow for friction, etc., add one-third, making 12 H. P.

STEEL is not made directly from pig iron, it being found impracticable. In what is known as the cementation process bars of wrought iron are heated for several days in contact with charcoal powder, during which time the iron absorbs a quantity of carbon, but as this product is of unequal composition and structure, the bars are melted in crucibles and cast into ingots. These ingots are heated and rolled, which renders the steel fine-grained and tough. By the Bessemer process mol-

ten cast iron is run into a large receptacle lined with a mixture of quartz, sand and clay (converter). A powerful air blast is blown into the molten mass through holes in the bottom of the converter. This results in a rapid burning out of silicon, carbon, and other impurities, leaving nearly pure iron. The bessemerizing process is also employed in treating copper matte as it is drawn from the smelters. It results in burning out a large percentage of the sulphur present in the matte, leaving what is known commercially as blister copper, containing about 95% to 98% copper.

FROM England comes the best of fluorite specimens. These specimens are taken from lead mines of Derbyshire and Cumberland, where it is the gangue of the ore. Many of the specimens are crystallized, and come in amethyst shade, in blue, in green, in yellow, in brown and white, and rarely in rose or crimson red. The crystals are in cubes similar in shape to galena cubes of Joplin, Mo., and a number of these cubes attached to matrix make splendid specimens. Fluorite minerals are found in the United States—in Kentucky, Arizona and southern Illinois—but mostly there in massive form, though crystallized specimens in white, blue, yellow and green have been found. These, however, are much less transparent than the English ones and do not make pretty specimens. The finest crystals of fluorite ever found in the United States were found some years ago in an abandoned lead mine in St. Lawrence county, N. Y., the crystals being a beautiful green and over a foot in size each way, the finest of these specimens being exhibited in the Museum of Natural History, New York.

TO TEMPER A TAP, after the tap has been cut and finished take it in a pair of tongs and heat it to a blood-red heat over a charcoal fire or the blue flame of a Bunsen burner or blowpipe, turning it around so that one point does not get heated before another. Have ready a pail of clean, cold water, into which a handful of common salt has been put. Stir the water in the pail so that a whirlpool is set up. Then plunge the tap, point first and vertically, into the vortex to cool. The turning of the tap during heating, as well as the swirl of the quenching water, prevents distortion. In tempering, the temper of the tap requires to be drawn to a light-straw color, and this may be done as follows: Get a piece of cast iron tube about 3 inches in diameter and heat it to a dull-red heat for about 4 inches of its length. Then hold the tap, with the tongs, up the center of the tube, meanwhile turning the tap around until the straw color appears all over it. Then dip the tap in the water, when it will be found perfectly hard. The depth of the color, whether light or dark straw, must be determined by the nature of the cast steel being used, which can be gained only from experience of the steel.

THE various forms of copper furnace products are known by numerous names, descriptive of the form or condition in which they occur. Thus, the first fusion of copper sulphide as it comes from the furnace is called matte—it may contain less than 10% copper or it may contain over 50%, though usually less in the first smelting. It is customary to resmelt matte two or three times, each resmelting increasing the percentage of copper, the last time it is "blown up" in the converters to "blister" copper, which may contain 90% or more of metallic copper. "Blue metal" is a name given to matte containing 60% to 65% copper; "white metal" contains 70% to 75% copper; "pimple metal" is matte running 80% to 85% copper, and "black copper" is metallic copper containing 1% to 5% sulphur. In the Lake Superior copper region copper is known by various names, which describe the condition in which it occurs. "Mass copper" is the name given large masses of the metal; "barrel work" is copper in small masses which has been cleared of adhering pieces of the gangue; stamp rock is rock containing finely disseminated copper that can be recovered by stamping and concentration.

OAK BARK, POTATOES, DEXTRIN, STARCH AND ANIMAL FATS have been used as a preventive of boiler scale. Remedies for carbonate of lime scale is heating of the feed water or addition of caustic soda or carbonate of soda. Petroleum oil and refined oil have also been recommended as preventives of scale. The use of caustic soda should be attempted with care, as it burns the flesh upon contact. Caustic soda if used in excess also causes violent foaming. The carbonate of soda is preferred. Among the substances recognized as detrimental, and the use of which has largely been discontinued in boilers, are slippery elm, ground bones, horns and hoofs, potatoes, starch, dextrin, animal fats and animal or vegetable oils. When using refined petroleum oil, no large amount should be introduced to the boiler at one time. When hard scale has already formed in a boiler, an effective treatment is found in giving it a coating of kerosene oil, to rot it. The oil may be applied with a brush or spray. An easier method is to fill the boiler with water above the scale line, introduce the kerosene, and then open a small cock, allowing the water to slowly run out. This gives the oil a chance to reach the scale as the water subsides, evenly coating the whole interior surface. This rots the scale, and it may then be removed by scraping or by blowing out the boiler. Still another way to remove lime scale is by introducing a quantity of caustic soda—40 to 50 pounds in a large boiler and then adding water, boil at atmospheric pressure for several hours (with the safety valve open). This softens the scale and it may be scraped out. Then wash out the boiler with clean water.

Ore Deposition and Vein Enrichment by Ascending Hot Waters.*

Written by WALTER HARVEY WEED, Washington, D. C.

The enrichment of mineral veins as a result of the migration of material from an upper oxidized or disintegrated part of a vein to a lower level, where it is redeposited, is now generally accepted as one explanation of the occurrence of bonanzas in gold and silver veins, as well as that of hodies of high-grade ores in cupriferous deposits.

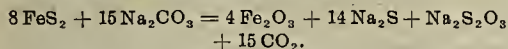
My studies of the copper veins of Butte, Mont., show: That the veins there are of several ages and systems; that the older primary quartz pyrite veins were reopened by later movements, correlated with a period of volcanic activity, and that they were penetrated by hot alkaline waters carrying copper and arsenic in solution, which was deposited presumably by reaction with the pyrite of the original vein.

The enormous development of the Butte deposits, attendant upon the extraction of nearly 10,000 tons of ore a day, has revealed many facts concerning the nature and distribution of the ores. Enargite, the copper sulpharsenide, formerly a relatively rare mineral, is now found to be the chief ore of some veins and to constitute a large part of the high-grade ore of the eastern properties. Its distribution is peculiar, and its significance can only be understood as a result of detailed study; but several facts stand out prominently, viz.: It occurs in immense ore hodies, connected with faults, extending from the oxidation zone to unknown depths in some veins. But, in most cases, it first appears in deep-level workings. This ore was recently found in the 2000-foot and 2200-foot level of several mines; it is clearly older than the pyritic ores, but younger than the great glance ore hodies, and is formed in small quantity in later fault veins.

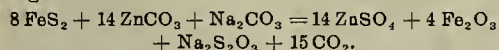
In the discussion of the genesis of the Butte deposits with the late Clarence King, he at first combated the principle of secondary enrichment, and adduced the presence of enargite as a conclusive argument against it. The later discovery of masses of hrecciated enargite cemented by glance proves the enargite to be of earlier formation; and though the pyrite is the only possible source of the copper and arsenic in the original vein, numerous assays showed almost total absence of arsenic from these ores. In brief, all the evidence showed that enargite, though not a "primary" vein mineral of the original vein, did not come from descending solutions, but must have come from below.

The bonanza ore of Neihart, Mont., has been described by me as an example of secondary enrichment by descending waters. In the light of a ripe experience and the experimental work of Dr. Stokes, it appears possible that the pearcite (arsenical polybasite) ores result from uprising alkaline solutions, though later descending solutions, carrying material derived from the oxidation of the ores, has taken place and complicated the situation. At any rate, it is difficult to account for the large amounts of arsenic necessary for the formation of these ores by the oxidation of very large amounts of primary pyrite almost devoid of it, while the occurrence of arsenic in hot-spring waters is known at La Bourhoulle, France, and the Yellowstone Park.

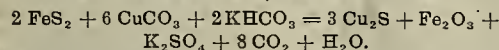
Recent experiments made in the U. S. Geological Survey laboratory by Dr. H. N. Stokes show that metallic sulphides are reduced and precipitated from alkaline solutions of the general character of hot-spring waters by pyrite. The metallic substances may be assumed to be present as oxides of zinc, copper, lead, etc. The reaction with the alkaline waters alone is represented by the equation:



In the presence of a metallic oxide reacting with Na_2S , e.g., ZnO , PbO , etc., the equilibrium will not be reached short of total decomposition of FeS_2 , and we get



These are the only products present, and the reaction is complete with excess of ZnCO_3 . The formation of Fe_2O_3 by action of a metallic salt on FeS_2 is new, as is also the formation of thiosulphate. The latter was proved beyond question by qualitative and quantitative methods, and there is no evidence of the formation of sulphites. Pyrite and marcasite, with CuO in bicarbonate solution, react as follows:



Experiments with both pyrite and marcasite at 200° C. show that the theoretical amount of sulphuric acid is actually formed.

That such waters actually occur in nature is not absolutely known. The Yellowstone Park waters are, however, nearly of this character, and in several springs at the Norris Geyser Basin are actually depositing the red and yellow sulphide of arsenic, and in one case auriferous pyrite. The Boulder hot

springs, where mineral veins are now in process of formation, in which small amounts of copper, gold and silver are deposited, are dilute solutions of alkaline waters.

From my study of the waters and veins of the last-named locality, I am led to the following theory of primary ore deposition:

Recent researches have demonstrated that openings can not exist in the rocks which compose the outer crust of the earth at depths of 30,000 feet or more, and that, indeed, under certain conditions, they can not exist at depths very much less than that. Observations made upon deeply buried rocks, brought to the surface by uplift and erosion, are in perfect accord with these deductions and prove that the "unknown depths" from which ore deposits in waters are derived can not exceed these figures. Assuming this to be true, it will probably be admitted (since heat and pressure facilitate solution) that hot waters circulating at considerable depths will dissolve and take into solution the various materials with which they come in contact. The capacity of hot water to contain such substances in solution will depend upon heat and pressure. The water will take up the less readily soluble salts only while the conditions are favorable. With less heat and pressure the solution may become saturated for any one substance and, though still holding it in solution, be incapable of taking up any more of that substance. In this unstable condition a slightly lessened temperature and heat would bring about precipitation.

In an ideal hot spring, the circulating waters slowly traversing heated, but solid, igneous rocks, out of which they dissolve various substances, fly toward the point of easiest escape, which is the hot spring fissure. For convenience, we will assume this fissure to be straight, 1000 feet to 2000 feet deep, and the waters to move upward very slowly. In its lower part, as in the pores of the adjacent rocks, heat and pressure are very great and the waters are not saturated, even for the most insoluble substances, and no minerals are deposited. Nearer the surface diminished heat and pressure make the water incapable of taking more of the less soluble materials in solution, forming what may be conveniently called the zone of saturation. Some salts, like alkaline sulphates, etc., are extremely soluble, and the point of saturation is scarcely ever reached in nature, even at the earth's surface. Others, like silica, may be present in such amount as to saturate the water; but the solution is clear, until cooling and relief of pressure cause supersaturation and precipitation occurs; an example of this was seen at the Opal and the Coral Springs of the Norris Geyser Basin, in the Yellowstone Park. Still higher in the hypothetical hot spring pipe, diminished heat and pressure cause the separation of the less soluble constituents, and for such materials this part of the tube is the zone of precipitation. It is well known that the metallic sulphides are soluble in alkaline solutions under heat and pressure; but examples showing their deposition by living hot springs are extremely rare. The more soluble substances will be carried farther upward before precipitation, and one might even suppose, if the solubilities of the substances were sufficiently unlike, that zones would be formed, each one of which consisting mainly of the particular substance thrown out by the change of pressure. This would produce an orderly distribution of the ores in a vertical direction. This, indeed, has been observed frequently. Chamberlin records it for the lead and zinc deposits of Wisconsin, and Rickard for those of Colorado and elsewhere. In the writer's own experience, the order appears to be galena on top, passing into highly zinciferous ores below, and this into low-grade pyrite. It is a common experience to find this association in silver-lead deposits in limestone. This would account, also, for impoverishment in depth and the passing into the ever-present and readily deposited silica.

The conditions in a hot spring tube are admittedly those postulated, i. e., lessening heat and pressure as the surface is approached; the assumptions made are natural ones. This, then, would explain why hot springs do not deposit metallic sulphides at the earth's surface. Owing to their relative insolubility, they are deposited—if present in the water—at depths below the surface. The Sulphur Bank quicksilver mines of California are examples. At the surface they showed only sulphur and no quicksilver. In depth quicksilver ores appeared. Were these springs to die out and degradation to remove the upper 200 feet of the ground, quicksilver veins would be exposed. It is probable that somewhat analogous conditions may exist at many hot spring localities, and that if we could expose the lower part of the conduit we should find ore deposits. This is the theory which the writer at present holds as to the genesis of the silver-gold veins of Lump Gulch and other mining districts of Jefferson county, Mont., and which he believes is a rational ascension theory. All secondary alterations are here excluded, these remarks applying only to the primary vein filling. It is lateral secretion only in the very special and limited application of that term to the leaching of relatively deep seated rocks and the gathering of such waters in a hot spring conduit.

The close resemblance in nature and occurrence of these Boulder hot spring veins to the jasper reefs of Clancy, Lump Gulch and many other mining districts

in the granite area of Jefferson county, Mont., has already been stated. It may be accepted as certain that they also owe their origin to hot springs, and that the ore deposits of such veins were formed by hot waters.

Applying these conclusions to the question of vein enrichments, it is first necessary to recall that bonanzas and rich ore shoots are very frequently associated with hrecciation and recementation of the vein filling. Where the evidence precludes "secondary" enrichment from above, the possibility of enrichment by a new or renewed supply of hot water coming up the newly-formed fracture must be considered. The successive reopening of veins was formerly an accepted explanation of an orderly sequence of mineral crusts, implying a repeated uniform reopening. Such exceptional cases may occur, but it is certain that many veins occupy fissures that are lines of weakness in successive periods of earth movement. Even in the deposits still forming at Boulder Hot Springs, Mont., the veins have been fractured and the fragments cemented by newly deposited silica. At Butte and Neihart the veins have been broken by post-mineral fractures with later deposition of rich ores. The evidence at Butte—furnished by rock walls, deposited ore and structural conditions—shows that the primary quartz pyrite veins were broken by fissures that became the conduit for ascending hot alkaline waters. Such waters would tend to deposit any burden of metallic salts in zones as already outlined; they would, also, be influenced by the existence of the crushed pyrite of earlier deposition, which is an energetic reducing agent.

CONCLUSIONS.—Ascending hot spring waters, if metalliferous, may deposit different ores with an orderly vertical distribution. Existing veins now mined often show this arrangement of metallic sulphides.

Ascending hot alkaline waters coming up through crushed and reopened veins containing pyrite, or marcasite, react with this sulphide, and zinc, lead, copper or silver, if present, are thrown down as sulphides.

Ascending hot acid waters may leach the lower levels of reopened veins and deposit gold, silver and copper upon cooling at higher levels.

Coal Industry in British Columbia.

United States Consul A. S. Smith at Victoria, B. C., says of the coal industry of British Columbia as follows:

The Vancouver Island mines are better developed than ever in the history of the Province of British Columbia. During 1902 coal was mined to a larger extent than ever before, notwithstanding the competition with the fuel oil of California. About 1,731,000 tons of coal were mined in the Province during 1902, and about 200,000 tons of that amount were converted into coke, making 127,800 tons of this latter product.

There has been an important discovery of anthracite coal 4 miles from Cumberland, near the celebrated Comox mines. The deposit is found to be extensive, the same vein cropping out in places 2 or 3 miles apart. None has been brought to market, but sixty men are employed in developing it and a railway is in process of construction thereto. The anthracite is of excellent quality, shows an analysis of 80.7 in carbon, and is practically smokeless. The Wellington Colliery Co., which owns the ground, expects to have the coal on the market by next fall.

The Extension mines, 10 miles south of Nanaimo, owned by the Wellington Colliery Co., have been closed since the middle of March. The cause is not any question of wages. In March a meeting of the employees was held to consider the question of asking for increased wages, when, at the instance of a representative of the Western Federation of Miners, a large majority of the men present voted to form a union and to make it a branch of the Western Federation. As soon as news of this action reached James Dunsmuir, the president of the Wellington Colliery Co., he directed that a notice be placed all through the vicinity that the mines would be closed April 1, 1903. The men responded on March 10 by voting to quit work at once. Since then not a ton of coal has been produced in this great mine. The men insist on their right to join any union they choose, and the directors of the Wellington Colliery Co. maintain that while they have no objection to the men forming a union among themselves, they will not employ men who belong to an international organization and are subject to the orders of men living outside of Canada. The result is that 1000 miners have since been idle, and the town of Ladysmith is rapidly becoming depopulated. Large numbers of miners have left the island and have obtained work in the Crow's Nest, or Washington mines. The president of the colliery company, in a published interview, insists that he has spent millions of dollars in the development of his mines and will not submit to any interference by outside labor organizations, but will rather close his mines for ten years.

Up to date, therefore, the expected extension of coal export to San Francisco, owing to the suspension of the United States duty on coal, has been effectually checked. Indeed, a coal famine in this city has been prevented only by the importation of

*Trans. Am. Inst. Min. Engs. (condensed).

coal from Washington, and the price has been raised from \$6 to \$6.50 per ton for household use.

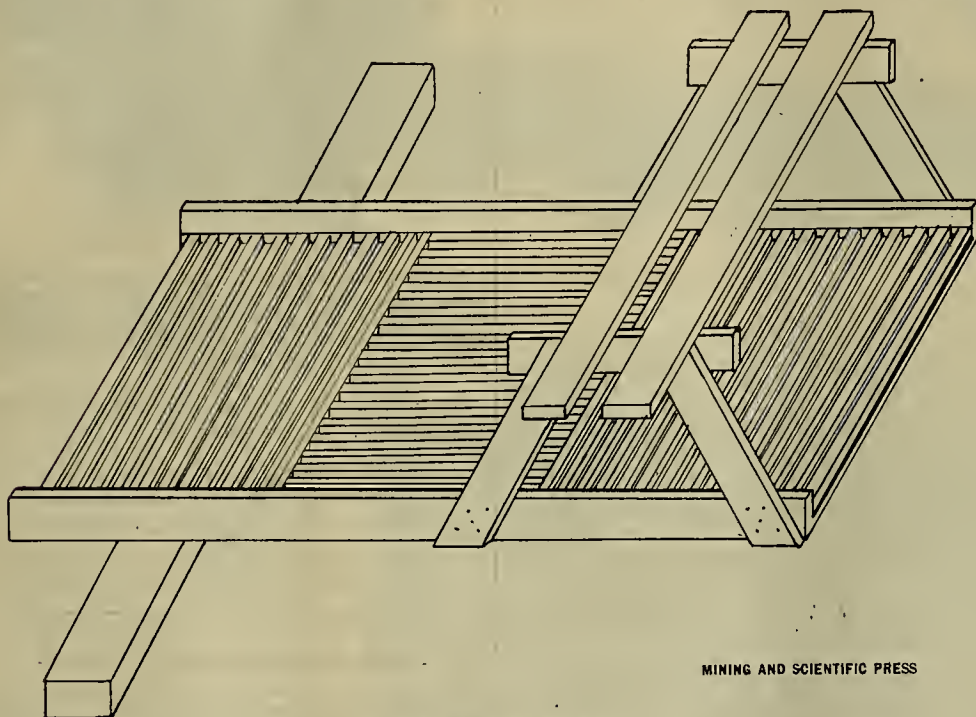
The acuteness of the situation here has been brought to the notice of the Dominion authorities at Ottawa, and a labor commission appointed to investigate the same. It will next month commence to receive evidence in Victoria and other points in the Province, but there is no promise of either side agreeing to accept the findings.

Beach Mining with a Surf Washer.

Written for the MINING AND SCIENTIFIC PRESS by
A. E. ELFNER.

The action of the waves may be utilized for washing the auriferous sands and gravel of an ocean beach in a very simple manner. The process is quite similar to ordinary sluicing. A shallow riffle box, 8 or 10 feet long by 3 or 4 feet wide, is set in the surf and weighted down with houlders or sand bags. The "pay dirt" is either shoveled in, if it is within shoveling distance, or brought to it in wheelbarrows and dumped in the center. As the waves run through this box, they spread the dirt and wash it out, leaving the gold in the riffles.

This device has been called a surf washer, and the accompanying sketch gives an idea of its general appearance. Both ends are open; the sides are raised only about 2 or 3 inches above the riffles, which latter are divided into sections for convenience in cleaning up. The cross-piece under one end is to be loaded down with weights to steady the washer in the surf, and the raised platform at the other end is for the same purpose. The surf washer must be so placed on the beach that the waves will run well through it,



A Surf Washer for Beach Sands.

and then recede completely out of it, and it must be pulled up, or down the slope of the beach with the tide.

Some beaches have a good natural grade, permitting the use of an even bottom on the surf washer, but on a flat beach it may become necessary to give the washer itself some slope to get a working grade, especially if very fine sands are to be worked. The usual sluicing grade, from 8 to 10 inches to the box length (12 feet), seems to be about right. It is well to use quicksilver in the riffles. In some cases it might be advisable to use plates also.

The amount of work this device will do varies with the force of the waves. On calm days it requires very slow feeding, while with a medium strong surf it will take two good shovelers to keep the riffles filled up. Its most logical use is in working that part of a beach which lies between low and high tide points, and which cannot well be sluiced, because sufficient grade for a string of boxes cannot be obtained without setting the boxes in the surf, where it would be extremely difficult, if not entirely impossible, to support them against the shock of the waves. The necessity for overcoming this difficulty brought about the invention of the surf washer, credit for which invention is due to E. Mulgrew, an old-time Alaskan prospector, who built the first one at Topkuk, on Bering sea.

When I came to that place in the summer of 1900, the ground had been worked over two or three times and was considered about worked out. Several parties were sluicing—pumping sea water for the purpose—but most of the men used rockers and grizzlies. Nobody seemed to make much more than wages, especially not the men with rockers, who could hardly earn enough to keep them in grub. I used a rocker,

myself, for a few days, and found that it did not pay. Then I thought I would give Mulgrew's invention a trial. I copied his idea on a small scale, building a washer about 2x6 feet, and made a six-hours' trial run on the black sand at the edge of the water. I cleaned up \$25, and as long as I continued to use the surf washer I never failed to get at least \$1 per hour for my work, while on an average I made considerably more.

Although this is eminently a poor man's device, being easily constructed and inexpensive, I see no reason why it could not be applied on any scale desired. By anchoring a buoy and pulley a little distance from shore and using a horse or some other power for pulling, the surf washer could be enlarged and its capacity increased accordingly. Any number of washers could be set side by side on the beach, and they could be fed by means of wheelbarrows, scrapers, or some sort of conveyor wherever the material to be treated is too far away to be shoveled directly into the washers. The money otherwise expended in pumping water for sluicing, or in ditching, can be applied to the economical handling of the ground.

Some Notes on Iridium.

Iridium occurs both as native iridium and as a constituent of the natural alloys, osmiridium and platiniridium. That which is found associated with placer gold from California and Alaska is recovered by the United States Mint at San Francisco, Cal., in the following manner: Being insoluble in sulphuric acid the iridium remains with the gold sponge in the bullion refining process. On melting the sponge the

iridium crystals settle to the bottom of the pot. The gold is poured into bars with the exception of a small portion in the bottom, which is allowed to cool in the pot. This hutton, or "king," is saved from each melt during the year, and at the annual cleanup in June they are all melted down, collecting the iridium in a single "king." These huttons are sold to pen manufacturers and the gold dissolved out by aqua regia. If much platinum is combined with the iridium, the alloy is dissolved by aqua regia, but osmiridium remains unaffected. On account of its extreme hardness, infusibility and indifference to reagents, osmiridium is used for pointing gold pens, for watch and compass bearings, and iridium itself for knife edges of delicate balances. Because of its occurring in very small grains, 3000 to 6000 in one ounce, but a small proportion of the native osmiridium is available for use by the pen makers (about 10%). Those crystals that are large enough to begin with sometimes break on being worked, due to their laminated structure. When a suitable grain is selected the procedure is: Attach to pen with silver solder; cut it through with a revolving copper-plate tipped with diamond dust, forming two halves of nih; then with oil and emery on another revolving copper-plate, grind to shape. The annual consumption in the United States of osmiridium for pen points is about thirty ounces. Katharinenburg in the Ural mountains, Russia, is the principal source, the annual production averaging 200 ounces. However, as the California mineral contains less platinum, it is denser, heavier and harder, hence more desirable. Pure iridium has a specific gravity of 22.42 and fuses at 1950° C. It is worth \$1.07 per gram, but in grains 50 cents per gram.

Mining in Bendigo.*

Written by L. A. SAMUELS.

In practical mining in Bendigo, the quartz mining center of Victoria, which recently celebrated its fiftieth anniversary of gold mining, Bendigo has not lagged behind other Australian mining districts in the evolution of mining from its crude state.

The mining managers are, without exception, practical miners. Many of these, perceiving the advantages and actual necessity of acquiring such knowledge as no amount of practical experience can supply, and which a progressive age renders absolutely necessary in pursuit of mining as well as in other callings, necessitating the use of the most complex machinery, scientific appliances and instruments, the metallurgical treatment of ore, concentration, as well as an acquaintance with various branches of exact and abstract science, have availed themselves of the opportunity afforded them in the Bendigo School of Mines, to acquire such knowledge, and thus combine the necessary theoretical with the practical education and experience which they have received as workers in the mines. The Bendigo mines, owing to their peculiar reef formations, so dissimilar to those in other localities, exhibit particular problems and difficulties. Owing to these peculiarities, shaft sinking, and, of later years, deep winze sinking, has been one of the main features of practical mine work in this mining district.

The peculiar so-called saddle formations of its quartz reefs have been often described. The formations are generally of considerable length, with comparatively little lateral expansion and depth. They are found below each other with very indefinite distances between them, and the anticlinal axis of the strata, where the cap of each formation is situated, dips, at an angle of 9° to 10° from the perpendicular, to the east.

Hence, shaft sinking always becomes a necessity when it is desired that new formations should be located. As, however, on account of the dip of the anticline, or, as it is locally termed, center country, to the east, it is generally required that crosscuts of considerable length be put in towards center country, from the deep shafts, and as these crosscuts, except when they are put in at very short intervals, are very apt to miss the intersection of a formation, the practice has been adopted of sinking winzes from the lowest working, starting slightly east of center country and, near as possible, hugging the anticlinal apex, even where the winze reaches a depth approaching 500 feet. The size of such a winze is seldom larger than 7x3 feet clear. It is closely timbered and divided into two compartments. One is for winding, and large enough to have room for a large kibble, bucket, or small cage. The other is used as a ladder road, and sometimes also for pumps, air pipes, etc., and also answers the purpose of ventilation. In the chamber or plat which has been constructed at the mouth of the winze, a 6-inch double cylinder air winch is placed in position. Now, if the distance to be sunk before a new formation is reached should not be very great, the same will be intersected in the winze, at or near the apex of the reef. Should the winze, however, be required to be sunk a considerable depth before meeting with a new formation, center country will pass away to the east, and short crosscuts in that direction will have to be put in, and by this means the positions of deeper formations are ascertained.

But apart from the primary purposes for which a winze of this description is sunk, it has a further advantage of much importance, by being of great service in the ventilation of the future lower workings when newly discovered formation is being operated and the bottom of the winze is connected with the main shaft, which has now to be deepened in order to attain that depth which the winze has already reached.

Shafts are already sunk to depths approaching 4000 feet, and workings at 3000 feet and below that depth are common. It may safely be said that without the aid of machine drills, air compressors, and other modern appliances, this would have been impossible. Furthermore, by these means, and the greater experience and intelligence brought to bear upon the matter of shaft sinking by the managers, their foremen and miners, it is a positive fact that sinking now at 3000 feet is less than it was formerly at a depth of 300 feet, while wages have remained practically the same.

To some extent, the lesser quantity of water encountered in the greater depth has also lessened the cost of sinking, and, in most cases, in deep shafts, pumps have been discarded and the water is being raised by means of haling.

With regard to the cost and mode of sinking, the writer is in a position to give reliable data, as a few years ago it was decided to sink a new main shaft in one of the mines under his management, 1000 feet, straight from the surface.

The size of main shafts in this district is generally 10x4 feet, or 4 feet 6 inches, in the clear of timber, divided into two winding compartments of 4x2 feet

* Trans. Aust. Inst. Min. Engrs. condensed.

10 inches, and one pump and ladder compartment of 4x4 feet. The two dividing walls of 2-inch timber make up the difference of 4 inches in length of shaft. In this case, this ordinary rule was not departed from, although an increase in length by 2 feet—making the total length 12 feet—is advisable.

Very large shafts are not such a necessity here as they are in other places, as the winding compartments of the size mentioned are quite ample for the required haulage, but the greater length mentioned affords more convenience in the pump and ladder compartment, which has to be utilized as a hauling compartment with air winch while sinking, and hauling water and mullock to the lowest plat from where it is then raised direct to the surface.

The sinking of this new shaft was commenced from surface in the month of September, 1897, and early in January, 1898, a depth of 400 feet was reached, the country passed through being of the ordinary description and may be classified as fairly hard and very hard sandstones and slates. It must be mentioned that, to a depth of 600 feet, the sinking was dry, as, to that depth the water was taken away by means of pumps from the adjoining shaft from which a crosscut passed nearly under the site of the new shaft at 600 feet. This depth was reached in the following March.

The site of the shaft having been selected to meet a deep center-country winze 250 feet in depth, from the just mentioned 600-foot crosscut, when this winze was reached, it afforded, of course, some assistance in sinking the next 250 feet, but a heavy body of water had now to be contended with and hard sandstone strata became predominant.

Sinking was, however, finished in the month of August, 1898, at a depth of 980 feet, in about eleven months from starting, during which time five plats had also been cut, viz., at 200, 400, 600, 720 and 900 feet from surface.

In sinking the shaft a bonus system acted as a strong incentive to the shaftsmen to push on the work. It had been arranged that, besides their ordinary wages, a bonus of £1 per foot should be divided pro rata among those men working in the bottom, for every foot sunk and timbered over 40 feet per fortnight. By this means the men's wages were sometimes very materially augmented, they being able to divide sometimes £5, £10 and as much as £15 among themselves.

(TO BE CONTINUED.)

Copper River District, Alaska.*

Written by A. C. SPENCER.

The Chugach and Wrangell mountains are drained principally by the tributaries of the Copper river. The former as a range is made up of mountains which have been carved by the numerous streams of the region from a portion of the earth's crust which formerly existed as a high plateau. The Wrangell mountains have originated essentially through the upbuilding of volcanic materials on a surface which is the extension of the Chugach plateau. Volcanic activity has been continuous in this group from the time of its inception, probably in the Miocene, down to the most recent time.

The Chugach plateau is considered to have originated in the uplift of a base-leveled land surface, and from the fact that this feature of erosion has been found to bevel the edges of folded and upturned lower Cretaceous strata its age is considered to be late Mesozoic or Tertiary. It is, however, impossible to fix the date more closely than between these limits. At the close of this long-continued erosion period the whole region had been so completely reduced that all topographic evidences of any dynamic revolutions of Mesozoic date were completely effaced. There could have been no elevations worthy of the name of mountains; no greater eminences than low hills existed to break the monotony of the extensive rolling plains. The upraising of the region was accomplished in several stages, but the intervening pauses were of very short duration when compared with the earlier period of base leveling.

Two paragraphs adapted from the report upon the Copper River district by Schrader & Spencer will indicate the character of the physiography of the Chugach mountains: (See illustration on front page.)

"The Chugach mountains occupy a coastal belt connected with the mountains of the Saint Elias range toward the east and with Kenai peninsula toward the west. The width of this belt is about 60 miles, and the mountain summits reach an elevation varying between 5000 and 7000 feet, though usually grouped about the elevation of 6000 feet, while above this occasional peaks rise to perhaps 8000 feet. To one who crosses the range by way of the valleys and low passes this general uniformity of level is not apparent, but from any considerable elevation within the region the impression is strikingly presented that the summits of the Chugach mountains represent the surface of an ancient plateau from which the mountain masses had been carved.

"The plateau character is well seen from the foothills of Mount Blackburn, in the Wrangell group.

* Extract from Bulletin of Geological Society of America.

The level crest line is a very striking feature to the eye, for at a distance of 25 or 30 miles the details of the dissection which the plateau has suffered since its uplift are lost, and only the uplift is noted. On a clear day the snow-covered peaks in the vicinity of Mount Saint Elias may be plainly distinguished, rising high above the general level of the plateau."

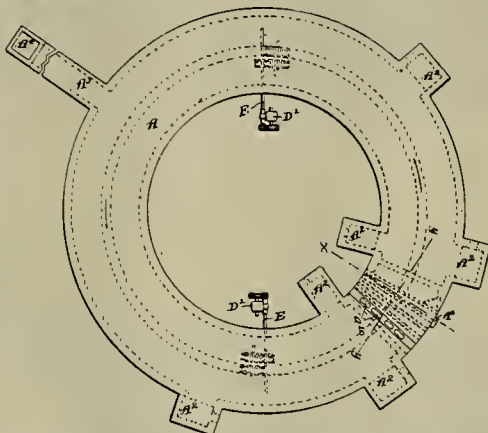
The tributaries of the Copper river, ramifying over an area of approximately 25,000 square miles, take practically all of the drainage of the Chugach and Wrangell mountains. This extensive drainage system is believed to have been developed during the erosion of the Chugach peneplain, and to have persisted with all of its major characteristics, by means of the active downcutting of stream channels continued pace by pace with regional uplift.

Mining and Metallurgical Patents.

PATENTS ISSUED MAY 26, 1903.

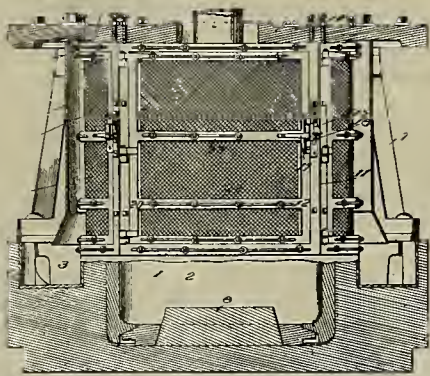
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MEANS FOR TREATING ORES.—No. 728,908; F. D. Gross, Denver, Colo.



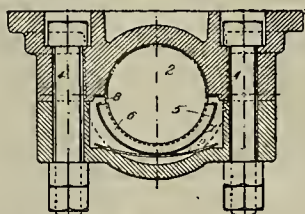
In treating ores, combination means for carrying ores, series rods carrying rabbling blades inclined relatively to path of movement of ore, part of rods being fixed, and remainder rotatable, rotatable rods provided with blades both sides inclined in same direction, means causing blades one side of rotatable rods to work in opposition to blades of fixed rods to rabble ore, means for causing blades on other side rotatable rods to work in concurrence with blades of fixed rods to discharge ore, and means simultaneously removing rabbling and discharging means from path of ore.

STAMP MILL.—No. 728,999; J. A. Shields and J. W. Shields, Lake Linden, Mich.



In stamp mill, and in combination with mortar, screen surrounding mortar, composed of sections or grates hinged at one edge and adapted to swing horizontally at opposite edge, means for securing sections at outer edges when closed.

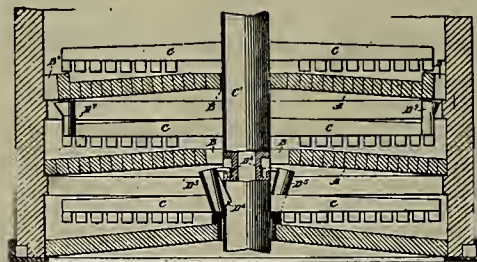
BATTERY STAMP STEM GUIDE.—No. 729,169; J. H. Hendy, San Francisco, Cal.



Combination in stamp stem guide of box, chambered cap fitting thereto, bolts by which it is secured in place, cushion of felt or equivalent flexible mate-

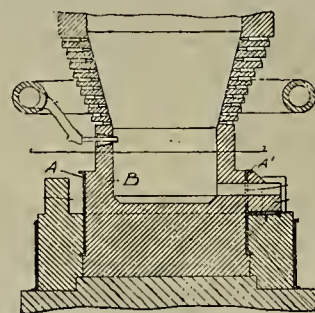
rial, segmental spring having inturned ends adapted to hold felt and to curve it to fit stamp stem, supplemental spring supported and pressing upon back of spring-inclosed felt whereby it is maintained in contact with stamp stem.

ORE ROASTING FURNACE.—No. 729,170; J. B. F. Herreshoff, New York, N. Y.



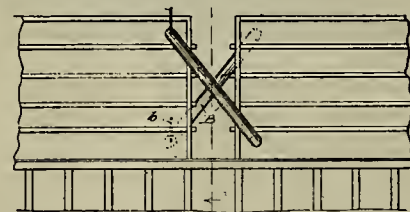
Roasting furnace having superposed shelves apertured for passage of ore, and means for crowding ore toward apertures of shelves, in combination with spouts extending between shelves and adapted to direct ore on way from one shelf to next shelf below in such manner as to protect ore from influence of draft.

BLAST FURNACE HEARTH.—No. 729,105; M. M. Suppes, Elyria, O.



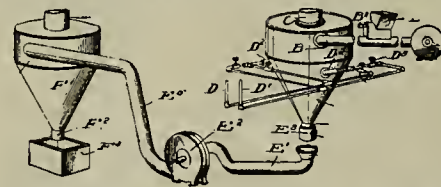
In blast furnace hearth, jacket plate or section having tap hole and integral trough or spout surrounding hole, and refractory lining for trough such depth and thickness as to extend considerably below and laterally of edges of hole.

APPARATUS FOR MAKING SULPHURIC ACID.—No. 728,914; N. L. Heinz, Lasalle, Ill.



In apparatus of class described Glover tower, acid chamber, and flues for conducting gases from tower to chamber, flues being arranged enter chamber near front end from opposite sides, at different levels and transversely to length of system whereby gases passing through flues into chamber caused enter in opposite directions, at different levels, and transversely to general course through chamber.

PROCESS OF ROASTING ORES.—No. 729,009; H. M. Sutton, W. L. Steele and E. G. Steele, Dallas, Tex.



Process roasting ores consisting in suspending particles in moving body air and subjecting them to heat and rotary motion to precipitate ore during expansion of air, collecting ore in moving body of cooler air, and separating ore from cooler air.

PROCESS OF CHLORINATING AND BROMINATING ORES.—No. 727,626; J. D. Hawkins and H. W. Fox, Colorado Springs, Colo.

Process of treating ores with halogen, consists bringing halogen hydrate into proximity to and raising temperature of hydrate to point sufficient to cause decomposition with evolution of halogen.

THE article on "Feeding Soapsuds to Air Compressors," with drawing, which appeared in the issue of May 9, was from Compressed Air, credit for which was inadvertently omitted.

Chain and Pick Coal Cutting Machines.

When machine coal mining was first completed the inventor's idea, in the designing of a machine, was naturally to imitate as nearly as possible the opera-

air, there never having been a successful electric puncher put on the market; whereas, the chain machine can be operated either by compressed air or electricity.

During the last few years the major portion of the coal mines that have been equipped with modern coal mining machinery have installed electric power

the mining machine, while about 30% would be an extremely high efficiency for an air mining plant where no reheaters are used.

Third—An extension of an electric feeder line may be made in a very few minutes by the machine runner himself, if necessary, while the laying of additional pipe for compressed air for the necessary extensions is, under the most favorable conditions, a good deal of an undertaking.

Fourth—The cost of maintaining a compressed air line is at least three times as great as an electric line. The acid water of mines is very severe on pipes, and after having once been put into a mine they can rarely ever be used again, and much loss and expense is incurred in maintaining pipe lines from leakage. On the contrary, with the copper circuits of the electric system there is scarcely any deterioration, and the wires can be readily removed and placed elsewhere in the mine when any portion of the mine may have been worked out even after such wires have been in use for a number of years.

The only objection which has ever been raised against electricity for mine use is the mistaken idea of danger of coming in contact with the wires. There have been some accidents in mines operated by electricity, but they are extremely rare.

In the Kanawah and New River districts of West Virginia, for example, there are at the present time about fifty mines equipped throughout with elec-

tricity, and there is yet to be the first accident recorded which can be traced to any contact with electric wires.

The advocates of compressed air claim that the air liberated from the compressed air engines in a mine assists in ventilation. This is so, but the assistance is slight.

The initial cost of a chain machine is from three to four times greater than that of a pick machine. On the other hand, it requires the same num-

ber of men to operate each type of machine, a runner and a helper, and the pick machine will undercut only about 40% as much coal as the chain machine. This fact has been recognized by the differential in

tion of the pick miner, consequently the pick or puncher machine, as it is commonly known, was the first type of mining machines tried. The defects of this form of machine soon became apparent, and the

rather than the compressed air. Still, of course, there are a number of mines using the compressed air chain-mining machines on account of their either having a very large installation of compressed air

patent offices of both England and America were flooded with applications for patents on coal mining machines. The final result of this vast volume of inventions and patents has been the development of the present coal cutter commonly known as the chain-breast machine, shown in Figs. 1 and 2. The pick, or puncher machine, had, however, been improved until it now does very satisfactory work under certain conditions.

The purpose of both types of machine is to undercut the coal so that it can be shot down ready for loading into mine cars, but the method of operation of the two types is entirely different.

In operating a pick machine the runner sits on a board or platform, inclined to the face of the coal; one foot of the operator is braced against one wheel of the machine, and with the two handles he directs it against the coal, picking off the coal exactly as a miner would do, except with much more force to each blow. The undercut made is V-shaped, 12 to 16 inches in height at the face, and tapering back to a feather edge on the floor at the rear of the cut, the depth of the cut being from 3 to 6 feet deep, according to the thickness of the coal. A helper shovels away the cuttings as the machine, guided by its operator, loosens the coal in the kerf.

The chain or breast machine is placed in position ready for the first cut at the extreme left of the room, the outer frame being held firmly in position by jacks extending to the roof. The runner then throws on his power and the machine makes an undercut 44 inches wide, 5 to 7 feet deep (dependent upon thickness of vein), and 4 inches high, in from three to four minutes. At the end of the cut the machine automatically is thrown out of gear and is reversed so that the sliding frame comes back to its original position. (See Fig. 3). The machine is barred across the face of the coal the width of the cutter head and the operation repeated until the entire room is undercut. A helper shovels away the cuttings as they are brought out by the cutting chain.

The pick machine can be driven only by compressed

First—Increased initial cost of installation as compared with electric equipment, it being about one-third greater for a small compressed air plant with the machines at no great distance from the compressor, and the proportion increasing very rapidly as the distance from power house increases.

Second—An electric plant can be installed with a guaranteed efficiency of 75% from the generator to

the miners' scale of wages against the pick machine, which is 2½ cents per ton.

In the face of the differential shown above, machine runners can always be more readily secured to operate the chain type of machine than the puncher, on account of their ability to make much more money with easier work.

The lump coal is the coal on which the operator



Fig. 1.—Electric Chain Mining Machine.

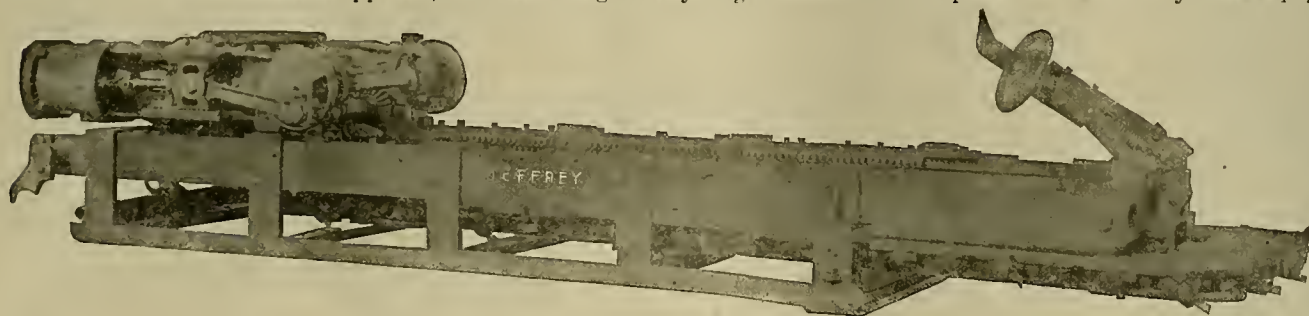


Fig. 2.—Air Chain Mining Machine.

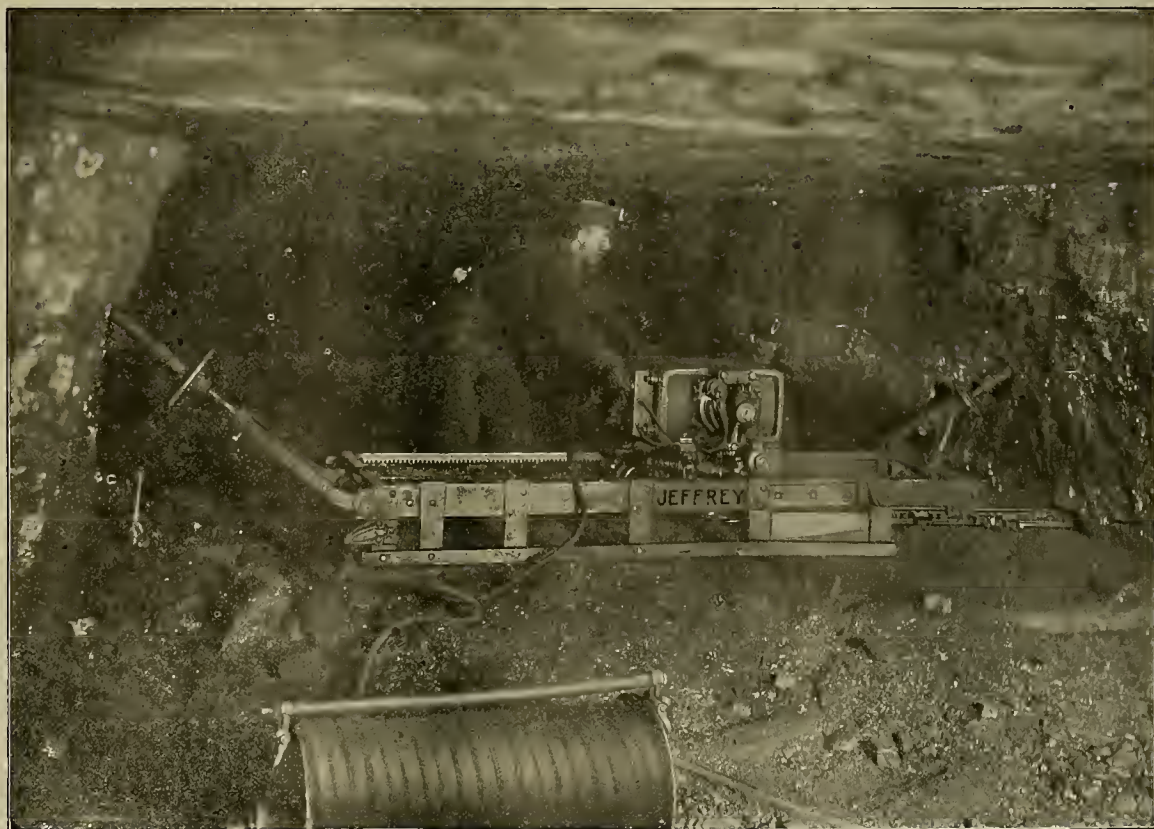


Fig. 3.—Electric Chain Mining Machine With Frame Partly Under Coal.

now makes the most money, and consequently a machine which gives him the greater percentage of lump is the desirable machine. The pick machine making the same kind of an undercut that the miner does with hand pick, gives very little more lump coal than the miner himself, whereas the chain machine increases the proportion of lump from 10% to 30%, dependent upon the character of the coal.

It is much harder on a runner to operate a pick machine than a chain machine, as he is continually jarred by the action of the machine. The chain machine runner need not touch his machine after starting it until the cut is completed. It has been found much more difficult to educate a man in the proper handling of the pick machine than to operate a chain machine. With the pick machine a great deal of the result depends on the skill of the miner in directing the blows of the pick, while the chain machine, after once being set into position, does its work independent of any direction from the runner.

That there is a certain field for the pick machine, of course, cannot be contested. Where the coal is very thick and of a soft nature the pick machine does excellent work. It can undercut rapidly under these conditions, and the V-shaped cut is well adapted to let the coal come down, whereas in a mine having coal of this character there is danger of its settling down into the 4-inch kerf made by the chain machine and not rolling over when shot. In order to work a chain machine to the best advantage it is necessary to have a fairly good top, so that posts can be set 10 to 12 feet from the face, but should the roof require posts set very close to face, a pick machine can be used unless such posts are required very frequently along face.

One claim made by the advocates of the pick machine is that it can be used in all parts of every mine, so that it is not necessary to have any pick miners. In all mines where chain machines can be used to advantage, which covers practically eight out of every ten mines, the chain machine can be used in every part of the mining except in the drawing of pillars.

The objection raised to having any pick miners in the mine is that it demoralizes the general workings of the mine to have two systems and two rates of pay. Drawing pillars, however, is a very small part of mining, and is usually done by old and experienced miners, who consider it an "easy snap," as coal on the squeeze is always easy to mine; this claim, therefore, need hardly be considered.

In a recent report the chief mine inspector of Ohio says: "But while the machines depending upon electricity for power are becoming more popular and are more generally used, those operated by compressed air are becoming fewer. In 1899 the compressed air machines numbered 44; in 1898, 58; in 1897, 67; in 1896, 79; in 1895, 86, and in 1894, 112."

Gold Mining in Siberia.

A French mining engineer, who for some time past has been investigating the gold mining industry in Siberia, says: The principal reasons why foreign capitalists have hitherto paid so little attention to Siberian gold placers may be summed up as follows:

The extreme irregularity of the gold deposits, at one point being very rich and at another very poor.

The great difficulty experienced in working poor placers, because (a) hydraulic working is, except in rare cases, impossible in Siberia, on account of the lack of water and the want of high pressure, which seldom exceeds 50 to 60 yards, the gold deposits in Siberia being situated in large, flat valleys, with only small streams of water; (b) dredgers on pontoon bridges are very rarely possible for the same reason; (c) excavators and automatic cables produce an economy of only 30%; (d) underground work is restricted and very expensive.

The additional income from the sale of goods to workmen of Siberian companies, which is not permissible to a foreign company. The extravagant prices demanded for placers already washed over, which are therefore of small or of unknown value, and only to be determined by expensive works.

This last cause may in a year or two disappear, but the others will remain. It is, of course, possible that rich placers may be discovered which may prove to be profitable investments for foreign capital. The gold veins remain, which are more advantageously situated and will not be so soon exhausted. In these, the future of Siberia's gold mining will lie.

THE American Institute of Electrical Engineers will hold their next annual meeting at Niagara Falls June 29 to July 3, 1903. Among papers to be read at that convention are: "The Electrical Equipment of the Gold Dredge," by Ralph L. Montagu; "The Legalized Standard of Electro-motive Force," by H. S. Carhart; "Engineering English," by T. J. Johnston; etc.

Notes on Automatic Ore Sampling.

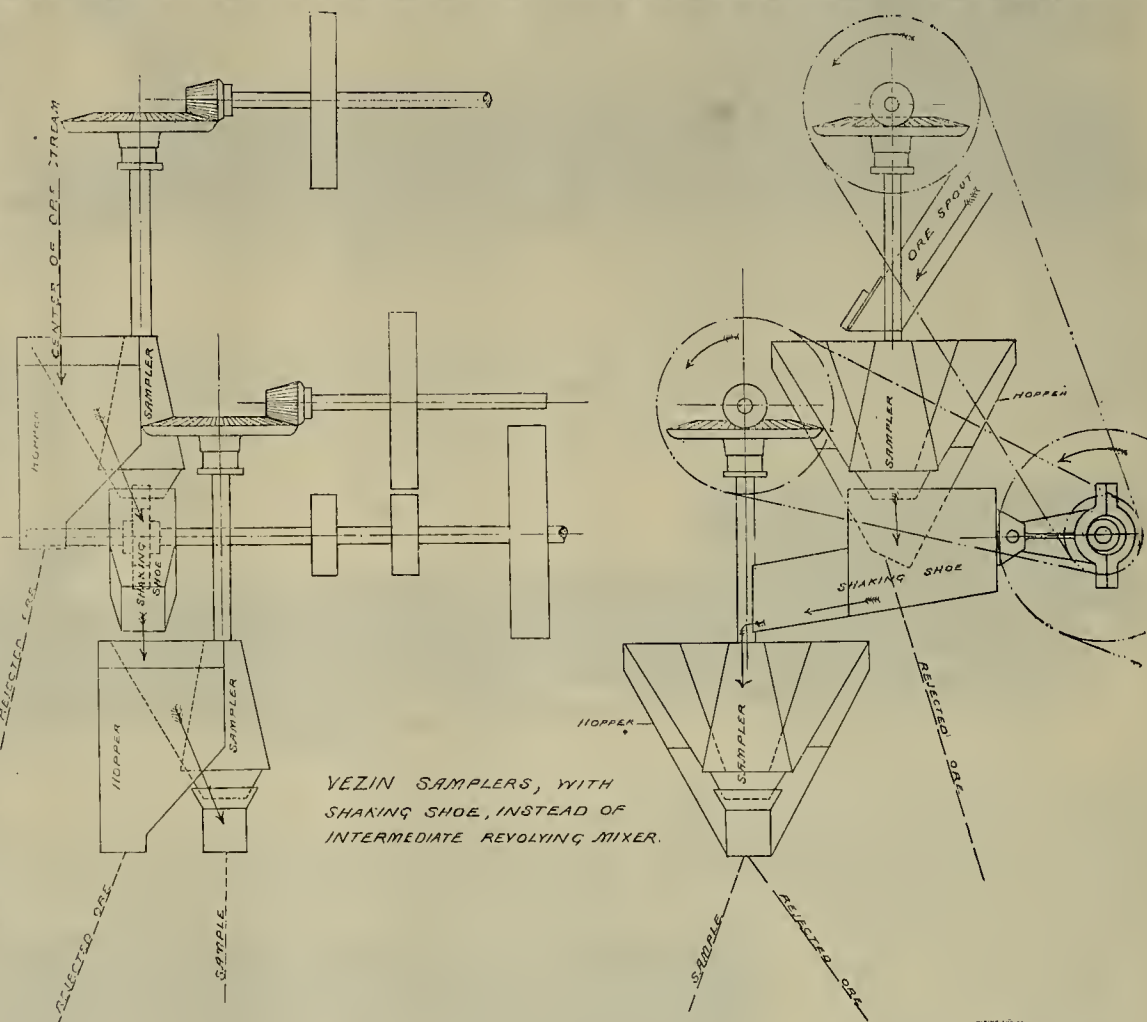
Written for the MINING AND SCIENTIFIC PRESS by
ALFRED HARVEY, E. M.

Automatic sampling is rapidly coming to the front, and automatic sampling machines of some sort are to be seen at up-to-date smelting plants and mills.

There are many sampling machines on the market. The two, however, which I believe are accepted as standard machines, and among the few which will sample correctly, are the Vezin and New Brunton

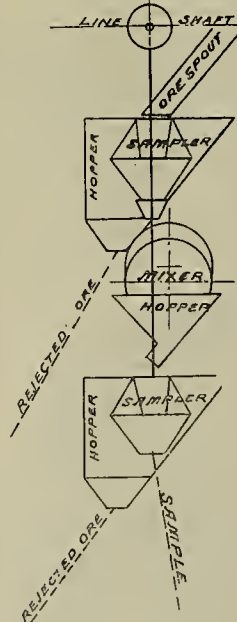
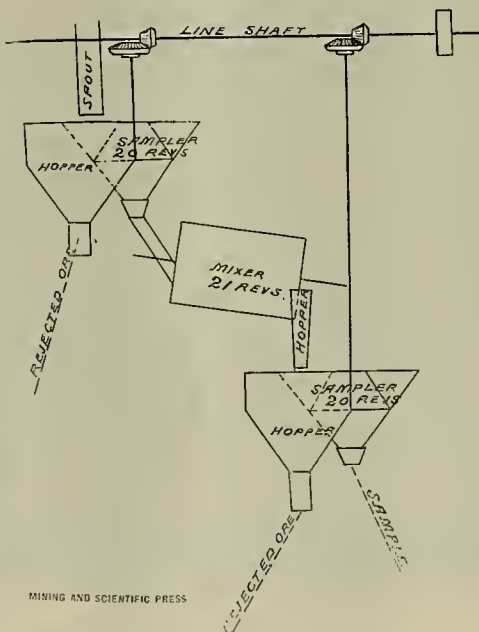
sample from any part of the stream continuously—it could not be a representative sample. But to cut out the whole of the stream at intervals of so many times per minute would be correct sampling from a common sense point of view.

Being far more familiar with the Vezin sampler, in its different forms, than with any other, and having worked a good deal with the late Henry A. Vezin, the inventor of the machine (a prominent mining engineer, and well grounded in the subjects of sampling and milling), I shall follow the workings of this machine, most of the information being given to me



SIDE ELEVATION.

END ELEVATION.



samplers. Both these cut out the whole of a stream of ore, at stated intervals of time, as a sample, in distinction to those machines which take part of the ore stream all the time.

The latter method I consider unsafe, for where coarse and fine ore are running together in a stream, as down an elevator shoot, the fine will work to the bottom. The lack of uniformity in values in coarse and fine ore from the same mine, which is so often the case, would make it extremely unsafe to take a

by him. The Vezin sampler is not patented, is of simple construction, and not expensive; is durable and easily cleaned. I give outlines of two machines, one suitable for 4-inch material and one for from 1 to 1½-inch material. The upper and lower cones of the sampler and the hopper are usually made of No. 10 steel, B. & S. W. G., and generally made cold. Where greater durability is required the scoops are made of ½-inch plate. The form of the upper portion prevents flying particles from getting into the

sample. It has been made, however, by special request, with this part cylindrical, so that the scoops could be easily put on and taken off. Each machine shown is arranged to cut out one-fifth—that is, two scoops of one-tenth each.

I have given two views in outline of two Vezin samplers, with intermediate cylindrical mixer, and hoppers in place. The samplers are of slightly different design, from those for coarse ore, and are arranged for sampling ore which has been crushed to pass about a 1/4-inch ring. The upper one cuts out one-fifth and discharges it into the mixer, which changes the intermittent into a continuous stream and then discharges the ore over a second sampler, which also cuts out one-fifth, making the sample one-twenty-fifth of the whole, the course of the ore in this instance being from the car onto a shaking screen. The screenings were conveyed directly to an elevator, the oversize through a 15x9-inch Blake crusher, thence to the same elevator. This elevator raised all the ore to a revolving screen. The screenings (say 1/4-inch) were discharged over the upper sampler, the oversize returned to 14x27-inch rolls, and after being crushed was raised by the elevator again to the revolving screen, and so on, until all the ore was sampled. The rejected ore from the samplers was conveyed to the bins.

In a 100-ton lot of ore this sample—one-twenty-

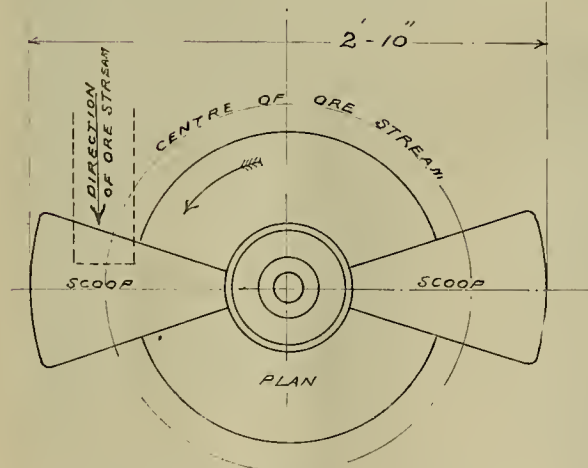
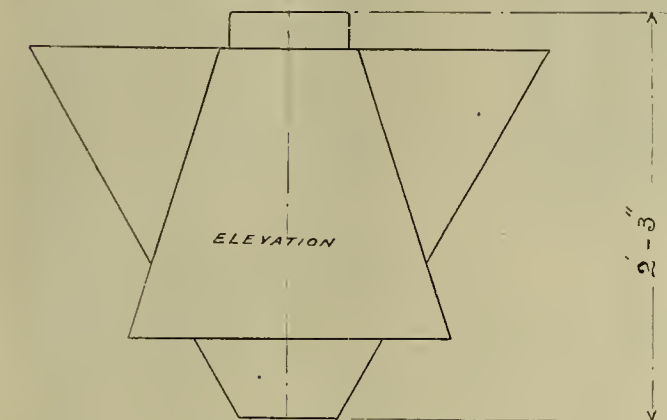
inclined (generally about 50°) so that the stream of ore comes to the samplers in the same direction as that in which the scoops are moving. These spouts should not be placed perpendicularly over the scoops.

The intermediate revolving mixer shown is 2 feet in diameter and 2 1/2 feet long, and provided inside with haffle plates, which are in a plane at right angles to the axis of the mixer. The irregular flow of ore (being the scoopfuls) received from the upper sampler is turned into a steady stream and passed on through the hopper to the second sampler. This arrangement is suitable for ore intended for milling purposes, but smelting works would require it coarser.

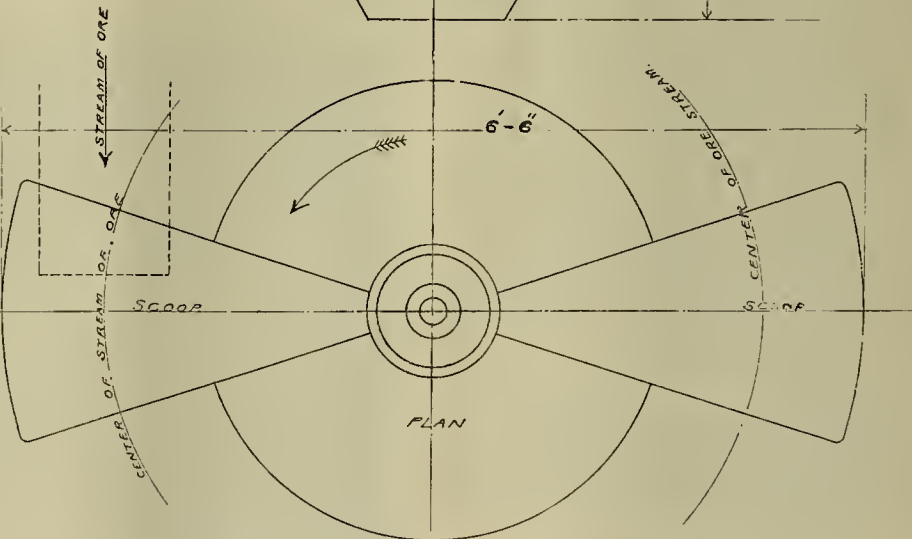
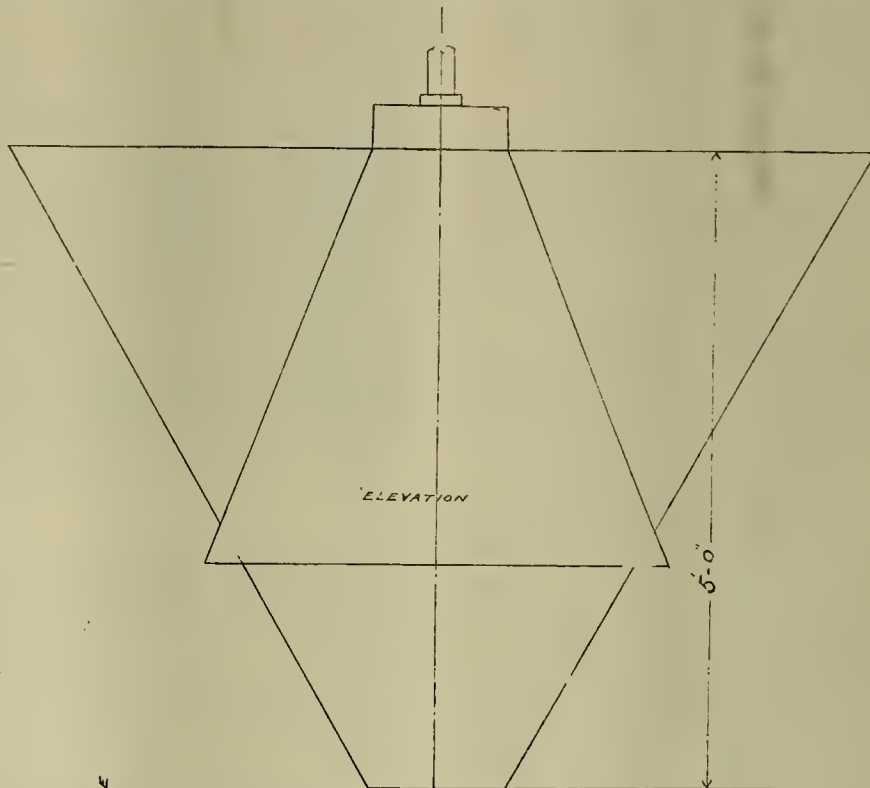
Phillip Argall, manager of the Metallic Extraction Co.'s works near Florence, Colo., found that remark-

Diam. of Largest Pieces—		Minimum weight of sample.
Mm.	Inches, approx	
1	1/16	1 ounce
2	1/8	1/2 pound
4	1/4	4 pounds
8	1/2	32 pounds
16	3/4	256 pounds
32	1 1/2	2,048 pounds
64	2 1/2	16,384 pounds

And so on, until for 5 1/2-inch pieces we have 79,000 pounds. These figures, as also a great deal of information herein contained, were given me by the late Mr. Vezin, whose long practice in automatic sampling makes them the more interesting. If the basis of this calculation (1 ounce) is larger than necessary, then all the other weights would be reduced in the same proportion.



VEZIN SAMPLER FOR
FROM 1" TO 1 1/2" MATERIAL.
HOPPER NOT SHOWN.



VEZIN SAMPLER FOR 4" MATERIAL
WITHOUT HOPPER.

fifth—would be 4 tons. This would be recrushed in small rolls and passed over the samplers again, thence to the riffles and the sample grinder. Samplers with two scoops cutting out one-sixteenth each (so that the sample would be much smaller) could be used. This would give 1/16 of 100 tons, which would be a little more than 1 1/2 tons. This would be passed through the 20x12-inch rolls, reducing it to 1/4 inch or less, and discharging it to the sampling floor below, where it would be further cut down by riffle samplers, the rejected ore conveyed to the storage bins, and the samples passed on to the sample grinders. With very low grade ore the 1 1/2 ton of ore might be put through the samplers again before recrushing.

The samplers in this arrangement make twenty revolutions per minute, and (with two scoops) a scoopful is taken about every one and one-half second. They are so placed that the ore stream passes just outside the upper cone. The plane of the center line of the ore current forms a tangent to the circle described by the center of the receiving part of the scoop. Hence there is no wear on any part except the scoop. The spouts leading to the samplers are

ably close results were obtained by automatic sampling with the Vezin sampler. Much of the ore received at these works would assay from \$200 to \$300 per ton. Check samples corresponded within .02 ounce, or say 40 cents per ton. The cost of sampling at the above works was stated to be \$0.12 per ton. It is also stated that in sampling 32,000 tons of Cripple Creek ores the scoops of the machine wore down 1/2 inch only.

I give two views of Vezin samplers, with shaking shoe as intermediate mixer, for coarse ore—3 inches. This was designed to suit special conditions and would not be adopted in purchasing coarse ore. The sample taken by the first or coarse sampler would be recrushed before passing over the second sampler, the amount being too small for the maximum size of the pieces. Very much depends, of course, on whether the ore is high or low grade, and also the evenness of distribution of values. If a sample that will pass a 20-mesh screen can with safety be cut down to 1 ounce avoirdupois, then the following weights would be the least that could be taken with safety, if the pieces are of sizes given, 20-mesh being about 1 mm.:

I think that in the sampling of a vein of ore, where cuts are made across the vein at specified distances, taking say 5 pounds of ore per foot, a carefully taken sample is often made worthless by quartering the sample in the mine before further comminution.

After coarse ore, such as is received at smelting works, has passed over the first or coarse sampler (say 3 or 4-inch material), which takes out one-fifth, one-eighth or one-tenth, as the case may be, or as much as is considered safe, it should be crushed finer before going over the second sampler. The material can be saved in a bin, and, where it is considered safe to take out one-tenth or one-fifth of the original ore, it can afterwards be crushed finer, then passed over two samplers with intermediate mixer.

The samplers for the coarse material are arranged with one scoop to take a scoopful every four seconds, the velocity of the falling ore being taken at 8 feet per second. The smaller sampler, for 1-inch material, takes a scoopful every two and one-fifth seconds.

In a properly designed and constructed automatic sampling mill results will check closely, and in concentrating and other mills, where it is desired to

know what saving is being made on the ore treated, automatic sampling where the ore is being received and at the tailings end will show not only the value of the ore entering the mill, but the value going away in the tailings.

Practice of Quartz Milling on the Rand, South Africa.*

Written by FRASER ALEXANDER.

I have been induced to bring these notes on quartz milling before you because I believe that the subject has not yet been touched upon, and, as the matter is of such importance to us all, I trust you will accept the same, not as a matter of instruction, but being a subject in which we are all interested, and therefore possessing some opinion thereon, as a means of eliciting views from those far more competent to speak authoritatively on the subject than myself on the various points involved in the operations of a quartz mill.

For this reason you will understand that I am able only to lightly touch upon the subject, for to describe in detail the construction of a mill alone would occupy more of your time than you would enjoy, and I need say no more to excuse the brevity of my notes.

The present quartz mill is the outcome of many years of experience, differing very considerably from that in use, say, ten years ago, with marked improvement; but, many as the improvements have been, I believe that there are still more to be made, and, if I should judge by the undoubted gain in knowledge of the cyanide process by the interchange of ideas between those working, that the same would apply to millmen, I have therefore no hesitation in appealing to them to "come out of their shells" and cast off prejudices, so that by open discussion some light may be let in upon what is still in their minds at least an obscure subject.

The reduction of our basket gold-bearing quartz on the Witwatersrand is done almost entirely by means of heavy stamp mills, copper-plate amalgamation and subsequent treatment with cyanide, as most of you are aware, and I will endeavor to briefly sketch what I believe to be the common practice in vogue on these fields.

The ore when hauled from the mine is dumped over grizzlies, separating the "fines"—which are sent direct to the mill—the coarse rock being elevated to a height sufficient to allow it to gravitate, first, through a rotating drum or screen, where the rock is washed, and then onto the sorting table, where the waste rock is picked out, the pay rock being automatically discharged into the rock breakers—of various patterns, Blake-Marsden's being in most common use—where it is broken to about 2-inch cubes before being delivered into the mill bins, which are of various capacities, in most cases holding sixty hours' run of the mill.

The cost of a modern heavy mill erected on the Rand, exclusive of power plant, is, roughly, £310 per stamp for 100 stamps. The indicated horse power required to work such a mill is 3 H. P. per stamp.

The amount of water required to wash the crushed product over the amalgamating table is about six times the weight of ore crushed when the ore is first washed and sorted; but if the mill pulp is classified by means of hydraulic classifiers, the amount required would be fully eight times the weight of ore crushed. Little or none of this large volume of water is wasted and in a well-equipped plant it can be returned to the mill for reuse within two hours after it first passed over the plates.

The weight of stamp apparently most suited for crushing our basket, which is not so hard as some quartz lodes—Sheba G. M. Co., at Barberton, for instance—is the heaviest yet tried, viz., 1250 pounds.

Now, having glossed over the mill as a mechanical contrivance, I will class the work under two headings:

1. Crushing.
2. Amalgamating.

Crushing the maximum quantity of ore to a determined degree of fineness is, undoubtedly, the first consideration of millmen on these fields.

The determination of screens to be used on each mine should be very carefully settled by experiment on the ore over a period covering, say, three months, during which time three thorough practical tests can be made with 1000, 800 and 600 mesh light screening (square inch).

The screens mostly in use on these fields are 700 holes to the square inch (light), and it is surprising to find a difference of fully half a ton duty per stamp per diem as a result of crushing under apparently equal conditions.

The weight of stamp, speed, length of drop, height of discharge and quantity of water appear to be the chief factors governing the crushing powers of a stamp mill through a given sized outlet.

A 1250-stamp, with 3½-inch stem, 16 feet long, with 20x9-inch bosshead, 12x9 inch shoes, will crush 5.5 tons per stamp per diem through a light screen of 1000 holes to the square inch, given a speed of ninety-five drops per minute, an 8-inch drop, a 6-inch discharge and six times the weight of water to ore crushed.

These figures are compiled from actual results obtained over a fairly long run on deep-level ore, and I quote these results in support of an exceptionally fine crushing on these fields with heavy stamps.

As I have before stated, the screens mostly in use on the fields are 700 light; the weight of stamps can be taken at 1050 pounds, and the average crushing, under practically identical conditions, as above, is 4.8 tons per stamp per diem; this apparently points to the heavy stamp being most efficient; but minor details in the practical working of a 100-stamp mill will, I feel sure, appeal to mill men as being of more than actual importance of weight alone.

Where 100 stamps are placed back to back, four white men and four natives are required on each shift to efficiently work the mill; if in one line, two whites and two natives can accomplish the proper care of sixty stamps.

The feed, which is automatic—Challenge feeders being invariably used—is of the greatest importance and should always be kept even, special care being taken that the stamp is crushing through the pulp in mortar box onto the die; if this is not carefully watched, the mortar box is liable to bank in one end and pounding will result, to the detriment of good crushing.

Speed and length of drop is of considerable importance, the first requiring an efficient power plant. I believe the maximum speed consistent with fair wear and tear to be reached in a 1250-pound mill, when ninety-five 8-inch drops are being registered, the enormous vibration consequent on an increased speed causing crystallization of both stem and cam shaft, without any appreciable gain in the rate of crushing.

The amount of drop is fixed by adjusting the tappet, allowing the cam to lift the stamps a certain height only, 8 inches being a common average. The tappets, being once set to allow the required drop, require constant care to keep each stamp working at its proper drop, and the shifting of one tappet in the set of five stamps will often very greatly retard crushing, not so much from defective crushing of this individual stamp, but through the irregular splash caused in the mortar box. When examining a battery in order to regulate the drop, first cut the feed as low as possible, which will allow a practiced hand to at once detect any variation in the drop of each set of stamps; it is often thought by workmen that, to save too often shifting of tappets, ½ inch will make no difference; but the reverse is assuredly the case. There is some divergence of opinion on the order of drop, some claiming 1, 3, 5, 2, 4; others 1, 4, 2, 5, 3, and again 1, 5, 2, 4, 3. The latter is, in my opinion, the best, causing the most regular splash and least waving, and, consequently, throwing out the crushed product through the screen more rapidly.

The use of chuckblocks for regulating the height of discharge has, I am sure, been thought out among mill men here, and should not exceed 6 inches where 1000 screens are in use, 5 inches for 800 and 4 inches to 5 inches for 600 or 700 screening. It is obvious that the escape of crushed particles of ore in the mortar box can not be too readily facilitated, for, on the other hand, hanking of material too coarse to immediately pass through the screen will certainly take place against the screen if the chuckblock is too low; the feed here plays a most important part and points to the height of discharge as being subservient to a close or full feed, the latter in all cases being decidedly objectionable to fast crushing.

It is here that I believe the sliming of ore takes place in excess of the actual slimes consistent with the peculiarity of our basket deposits, which, under reasonably favorable conditions, may be relied on to produce not less than 26% of slimes.

One case prominently illustrating my contention is that of two large mills crushing with 1000 and 700 screens, respectively, both making 30% of slimes; but, strange to say, the 700-mesh mill is producing nearly one ton of crushed material per stamp less than that produced by the 1000 screen, all conditions being practically equal. The screen is certainly a controlling but by no means a final factor in regulating fast crushing.

The water supply should in all cases be a constant one—that is, the head or pressure varying as little as possible—on these fields; about six times the weight of ore crushed is used in the mortar box, delivered through one or two pipes, arranged to discharge in some cases onto the feed chute and in others at the back of stamps into the mortar box; the first mentioned is found to give every satisfaction; the volume of water is indeed a large one, but as we have to face the question of pulverizing the ore to determine the degree of fineness, irrespective of the old-time methods of amalgamation, it matters little, so long as a rapid discharge of the crushed particles be ensured.

I do not wish to convey the idea, through above remarks, that our mills are being utilized merely as machines for crushing the ore. Far from it. They have always played a most important part in the production of gold and, I feel sure, will continue to do so for a very long time to come; but I certainly do think their first consideration is to crush the maximum amount consistent with fair wear and tear of the machinery, and in no way allow the time-worn practice of inside amalgamation to detract from the crushing abilities of the mill.

We now come to the important point, "amalgama-

tion," or should I embrace the wider term, "extraction of gold." I fear my convictions lead me to place copper-plate amalgamation as a very secondary extractor of the precious metal, and so will confine myself to the common practice of amalgamation as we find it carried out on these fields.

Large sheets of the purest copper obtainable should be used—12 feet long by ⅝ inch thick and 5 feet wide—this width more than covering the discharge from the mortar box. The plate, which is usually of one piece turned up about 2 inches on all sides except at the lower end, is securely fixed to a heavy wooden table by means of wooden laths screwed down on the outside of the turned-up portion and firmly bearing on the copper itself; the whole table can be easily removed in or out of position and should not bear or rest on the sills, king posts or foundations of the mill itself. Care must be taken to ensure a perfectly level, smooth surface, which admits of an even distribution of the pulp and unrippled flow from start to finish. These tables are usually made adjustable up or down for convenience of adjusting the grade, which is usually 1½ inch in 12 inches. Eight tons of pulp matter—that is, 1.15 ton solids and 6.85 tons water—can be passed over this table per hour without causing undue rippling or waving on the plate surface.

Inside amalgamation on copper plates fastened to the mortar has for some time past been replaced by the more general rule of feeding a little mercury into the mortar box every hour. The first method was found most undesirable; the coppers being damaged, pieces of amalgam became detached and afforded an easy means of pilfering by Kaffirs or dishonest workmen. The second method is preferred, not so much from its ability to collect a very large quantity of gold in the mortar, but by feeding the mercury in proportion to the value of ore being crushed, or about equal the gold contents in ounces per ton, it gradually works out of the box onto the table, and, being partially amalgamated, more readily adheres to the top portion of the table. This constant supply is claimed by mill men to keep the plate in the most perfect condition; but as, however, only about 4% of the total gold won by the mill is collected in the mortar box itself, it can hardly be claimed that this is a very profitable source of recovery when the loss of mercury is taken into account through this practice, it being about double that resulting from purely outside amalgamation.

The preliminary setting of plates is well known, and it will suffice to say the copper must be thoroughly well cleaned before the mercury is used; the plate, being carefully kept clean, is allowed to accumulate a thin layer or skin of hard amalgam, and, when this is accomplished, the routine work of dressing, scouring, brushing and the many attendant hurrying methods so dear to amalgamators is continued day by day. By thoroughly scouring or loosening the amalgam by means of rubbing the whole surface of the plate with a little clean sand or gritty matter, the amalgam becomes pasty and is easily removed without unduly affecting the copper itself, as with a chisel or other sharp instrument. Where this work is well done, the maximum amount can be taken from the plate each shift, and will prevent undue accumulation, besides largely obviating the necessity of frequently steaming the plate.

As the extraction (by assay) is considerably affected through neglecting to secure day by day the total gold deposited on the plate, I shall prefer to return to this important point further on.

The plates are brushed with a soft hairbrush, or lightly rubbed up every four hours, taking off any deposit of fine, heavy concentrates, black sand, etc., which always more or less settles on the clean surface of the mercury. When plates are in good working order they have the appearance of a dull mirror and are of a peculiar, stiff, pasty feel.

Steaming should be avoided as much as possible, as it often results in buckling the plates, through irregular expansion and contraction of the copper, and, where the plates are well scoured each shift, it will not be found necessary more than once in six months.

The application of steam as a means of heating the plates before hard accumulations of amalgam can be readily scraped off, is so well known that I need only say mill men are agreed on its utility as a safe and effective means of easily removing the amalgam from the plates.

Having now dealt with the usual practices, I find myself confronted with the still more imperfect result of only a little more than half the gold contents of the ore. I do not believe we shall ever be able to say: "The contents of 500 tons you crush per day contained so much (by assay), and that your due recovery being, say, 55%, please account for same." But I do claim that mill men are not fully alive to the responsibilities imposed upon them when they allow a difference of 5% to pass between theoretical and actual extraction, the actual amalgamating powers of the mill having been carefully determined on the average ore from the mine over a lengthy period—say, six months.

Either the assays must be wrong or the sample is contaminated with fine particles of floured amalgam—the latter being more often the case—and, if so, these unreliable samples may be looked for throughout the whole recovery process.

The average extraction per cent in fine gold recov-

* Journal Chemical and Metallurgical Society, S. A. (condensed).

ered from mills (by assay) is 57%, and varies between 52% and 65% in different mills. This in itself is of less consequence than the actual variation that frequently occurs in any one particular mill. If the ore is of such a refractory nature, and will only allow a specific recovery, then let us count on the mill regularly returning this fixed amount.

That inaccurate samples are responsible for more than half our troubles is certainly the case; but these inaccurate samples are chiefly the outcome of inside amalgamation.

The screen is a controlling factor, largely governing the quantity of gold that can be caught, but is by no means accountable for differences in which amalgamators appear to take so little interest. Accurate samples can be obtained in any mill where the importance is recognized by the man working same, and it can hardly be expected that any completeness is likely where no accurate knowledge of the result is secured.

Assaying Cyanide Solutions.

TO THE EDITOR:—As the latest among the meteoric shower of schemes for the assaying of cyanide solutions, I notice one written by A. H. Jones of the Smuggler-Union, Telluride, Colo., in which he recommends the use of zinc dust in acidified solutions for the precipitation of the gold and silver values from the solution, the same being removed by filtration.

This method seems to possess considerable ingenuity, as, from his description, I am led to believe that the reducing agent here is the hydrogen evolved and is not due to the action of the metal in displacing the values in the solution.

Mr. Jones states that, after due trial of all the other methods, he finds this to be the most reliable, and further points out its simplicity, and also its error; but he gives us only a broken vision as to its accuracy when he states that he has not been able to check out the clean-up at that mill. I, for one, would like to hear from Mr. Jones the reason he assigns for this discrepancy—whether due to the infusibility of zinc silicate or loss by sublimation with the zinc during assay or incomplete precipitation of the gold and silver.

I realize that a better method than the lead tray is wanting when solutions of a low value are to be determined; but, with higher values—for example, as we have here—I have found no difficulty in the use of the lead tray method and in the initial run, after which we made a complete clean-up, all the zinc being cut down. I found that the solution assays were high, to the extent of .18 of 1%, the solution assay checking out the clean-up slightly better than the sand assays. W. H. DAVIS,

Supt. Mill Idaho Gold Coin M. & M. Co.

Bear, Idaho, May 24.

California Polytechnic School.

First Annual Catalogue of the California Polytechnic School, a new State institution, being established at San Luis Obispo, has been received.

The purpose of the school is to furnish to young people of both sexes mental and manual training in the arts and sciences, including agriculture, mechanics, engineering, business methods, domestic economy, and such other branches as will fit the students for the non-professional walks of life.

The course of study outlined includes domestic science, agriculture, horticulture, animal industry, dairying, carpentry, iron work, freehand and mechanical drawing, physical geography, botany, entomology, chemistry, physics, mathematics, English, history and civics. The school announces a three-year course, and will open for students in September, 1903. The school is open to any boy or girl fifteen years of age who has completed a grammar school course, or who can pass an examination covering essentially the same ground. Applications to enter the school must be made on forms, which will be mailed to any one requesting.

A Revived Mining District.

Written for the MINING AND SCIENTIFIC PRESS.

In the northern part of Gilpin county, Colo., there is a district extending from Rollinsville west, about 8 miles, and from Wide Awake to Phoenix, about 6 miles, making a territory 8 miles east and west by 6 miles north and south. This district was opened up in the early sixties, and a great deal of placer min-

ing by the Northwestern Colorado Exploration Co. W. H. Knowles of Denver is manager. They have recently installed a 25 H. P. Hendrie & Bolthoff hoist. This property is being worked under a long time lease. The Benton is located near the Perrigo.

A little farther down the hill, in Gamble Gulch, towards Rollinsville, is the Gold Dirt mine, which has a record of having produced over a million dollars. This property is being worked



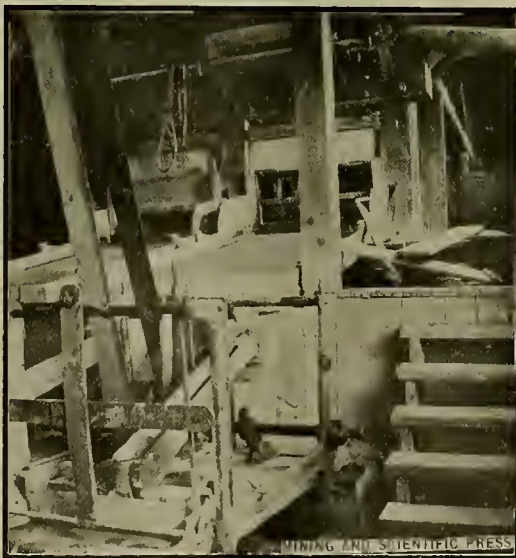
Perrigo Mill, Gilpin Co., Colo.

ing, sluicing, and in some cases milling was carried on, but the mills were very crude, and the ruins of some of them can be seen to-day. Wooden stems, cast iron shoes, and pieces of granite for stamp heads were used. Soon after the discovery of rich silver ore at Georgetown and Silver Plume, in Clear Creek county, most of the miners and prospectors left for the new fields, and active mining was never resumed except in a few instances, such as the

by the Pittsburg Con. M. & M. Co. under a long time lease. It has produced some high-grade smelting ore, which would permit of the excessive wagon haul to Black Hawk.

About 2 miles from Rollinsville is rich placer ground being worked by Stephenson & Bahcock. This property is located on Beaver creek.

Near here is the Blue Grass M. Co., operating the Champion, Decoration, Lone Star and Tenderfoot shafts.



Battery and Shaking Table, Perrigo Mill, Colo.

Perrigo, Gold Dirt, Stewart, and a few others.

The accompanying illustrations show the 30-stamp mill now in use at the Perrigo mine. This mine is worked by tunnel. The main tunnel is about 4000 feet in length. It is stated that this property has produced \$1,000,000 during the past five years. The mill is situated several feet down the hill from the mouth of the tunnel. This was done in order that the ore could be handled by gravity in the mill. The mill has 125 tons capacity. Plates and tables are used below the stamps. The concentrates are hauled by wagon to Black Hawk and shipped to the smelter. It is the intention of the owners, Potter & Lightborn of Central City, to erect a cyanide plant at the mill to handle the tailings. They also intend putting in a large power plant for supplying the surrounding mines with power.

The Benton mine is being operated

They have a large body of ore blocked out in the Champion awaiting the completion of their new 10-stamp mill. At the 250-foot level of the Champion they have smelting ore that averages \$30 to \$56 per ton. At present they are driving a crosscut 300 feet to reach the Decoration vein. This will cut the vein 270 feet below the surface. A crosscut is also being run from the Lone Star to the Tenderfoot. The concentrates will average \$27 to \$40 per ton. They have one 6x8 and one 8x10 hoisting engine and 40 and 60 H. P. boilers. R. L. Alexander is Sup't.

In this district there are other properties believed to be as good as the ones mentioned, but on account of the distance from the railroad, the excessive cost of wagon haul, and the scarcity of timber, they remain idle. On the completion of the railroad to Rollinsville the northern part of Gilpin county will see a steady growth.

Mining Summary.

Specially compiled and reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Willoughby and Walr groups at Funtier Bay have been sold to the Funtier Bay M. Co. The property consists of the Tellurium and Mountain King groups and the claims are said to show good ore.

Men have repaired and rebuilt the flumes of the Last Chance placer mine, near Juneau, and the work is completed as far as the upper end of the tunnel, a distance of 3000 feet from the dump, says the Dispatch. Grading is in progress across the rock slide at the upper end of Last Chance Basin, where 600 feet of the main flume will be rebuilt. This group is owned by the Jualpa Co., and they expect to begin hydraulic mining by July 1.

A 10-stamp mill is on the ground for the Bessie G. M. Co., at Yankee Cove, near Juneau. Superintendent P. Early has built a road to the mines from the beach. He will bring the boiler and engine from the 5-stamp mill down the skidway to the beach to run the sawmill.

ARIZONA.

COCHISE COUNTY.

Development work was started last week on the Big Four group of claims, near the Golden Era mine, near Bisbee. Shafts will be sunk on the ledge showing ore on the surface. The group consists of twenty-four claims. T. Hogan, R. H. Elliott et al. are owners.

Cobbe & Co., owning the Cable lease on the Copper Queen ground, near Bisbee, report making regular shipments of lead ore. The ore is a carbonate carrying values in silver, but no gold.

J. E. Prenty and H. Kreimer have men at work on the Oversight group, east of the Golden Era ground, near Bisbee. They are sinking shaft.

Operations have been resumed by the Princeton M. & S. Co. at the head of Ramsey canyon, 24 miles southwest of Bisbee. The company is made up of New York and Pittsburg men. H. Hamburg is president, with headquarters in Bisbee. The development consists of prospecting shafts, a tunnel 200 feet long and a winze 20 feet deep at the face of the tunnel, where ore was opened. There are six claims. The ore shows values in copper and silver, with trace of gold.

J. Plirung reports the Dutch Bakers group of claims in Warren district, near Bisbee, sold to the Calumet & Arizona Co. for \$200,000, says the Bisbee Review. The group adjoins the other holdings of the Calumet & Arizona and comprises eight claims.

Manager J. E. Bacon of Tombstone reports the Gold Farm group of mines in Dos Cabezas district bonded to Cincinnati, Ohio, parties.

The Dubacher group of nine claims, near the Copper Glance group, in Warren district, near Bisbee, have been transferred to A. L. Morris, et al. The price for the group is reported at \$150,000.

GRAHAM COUNTY.

Superintendent C. B. Spaulding of the Maravilla copper mine, near Solomonville, reports development work progressing. The main shaft is down 500 feet and a flow of water has been struck. It is the intention to sink the shaft to 550 feet and then crosscut 275 feet to main ledge. There are 100 tons of ore on the dump that will average 10% copper. The main body of ore is sulphide and carries also a trace of gold.

MARICOPA COUNTY.

The Chicago owners of the Vulture mine, northwest of Phoenix, are reported intending to resume this month and preliminary work is being done, but the principal work will be sinking a 1000-foot shaft. G. W. Sanders is superintendent.

YAVAPAI COUNTY.

Moynahan & Underwood have pumped the water out of the Storm Cloud shaft in Hassayampa district, near Maxton. The Cash mine has forty men at work. —PICKERELL'S mill and cyanide plant are running steadily.

It is reported the Conger mill, near Jerome, will resume. The Etta mine, from which this mill obtains its ore, has been reopened.

G. Harrington, manager of the Tiger G. Co., states the company will put up a cyanide plant on the Gray Eagle mine, near Prescott, to handle the tailings.

The Yavapai C. Co. expect to open up work on their property in Black Hill district, near Prescott, by July.

CALIFORNIA.

AMADOR COUNTY.

At the Buena Vista coal mine, near Lancha Plana, development is progress-

ing. At depth of 60 feet a body of coal 11 feet in thickness was found, and covering an area of forty acres.

At the Onaida mine, near Jackson, the shaft is down 2280 feet. It is the intention to sink 200 feet more. Sinking has been suspended temporarily, to enable new levels to be opened.

BUTTE COUNTY.

It is reported J. E. Doolittle, et al., of San Francisco, will work the blue lead on the Bangor mine at Bangor. It cannot be worked by hydraulicking because of no place to deposit the debris, but a dredger will be used.

CALAVERAS COUNTY.

The 35-stamp mill at the Wilbur-Wombles mine, near Hodson, is nearly finished. The Rialto M. Co., A. Caminetti of Jackson, Amador county, manager, has been organized to operate in the Gwin mining district. They own a group west of the Gwin mine.

EL DORADO COUNTY.

A 2-stamp mill has been set up at the Independence mine at Slate Mountain, near Placerville.

FRESNO COUNTY.

After a year's idleness, the Mount Hamilton Land & Oil Co. in Alameda, near Coalinga field, has resumed operations. W. H. Kerr, former manager of the Grant Oil Co., is superintendent.

The main pipe line from Mendota to Coalinga was completed last week and is ready to ship oil through to Point Richmond.

KERN COUNTY.

The Associated Oil Co. has made preparation for additional work in the McKittrick field. Five new rigs have been built and others will be added. They are drilling wells on the Green & Whittier and the Central Point in the Green River field, near Bakersfield, and on the Del Monte at McKittrick.

The Potomac Oil Co. has finished its well No. 31 at the Kern River field, near Bakersfield, and has nine wells in operation in the field, besides others at Summerland. All its wells at Kern River are being pumped.

J. Hansen reports operations begun at the cyanide plant of the Stanford M. & R. Co.

The Meadow County Oil Co. will resume operations on its ground near Bakersfield, south of Miller & Lux's ranch, where it has a water well. They will sink a well to 2000 feet.

MONO COUNTY.

The Southern Con., near Bodie, resumed operations last week.

NEVADA COUNTY.

The North Star Co., near Grass Valley, intend to build a 30-stamp mill at the Central shaft and grading began last week, says J. D. Hague, president of the company. Arrangements are also being made for removing the Rogers' mill at Boston Ravine to the Gold Hill mine.

The Gaston G. M. Co. was incorporated last week, with principal office at Carson City, Nev.; S. Weil of San Francisco, C. H. E. Hardin and P. B. Ellis of Carson City. The property of the company is at Gaston Ridge, north of Nevada City.

Manager A. C. Van House of the South Yuba Gravel & Tunnel Co. says preparations are being made to reopen their property on South Yuba river, near Nevada City.

The Murchie M. Co. of Willow valley, near Nevada City, have leased the Texas mill for crushing a lot of rock on hand, the Murchie mill having been destroyed by fire in April.

Work has begun to lay a 24-inch pipe from the South Yuba reservoir on Banner ridge to Union hill. The pipe will be 8000 feet in length and will be used to increase the water supply of the Brunswick, Union Hill and Empire mines, near Grass Valley.

At the Polar Star mine, near Grass Valley, the machinery is in, the galloways frame finished and sinking resumed, says Superintendent J. McCaffrey. The shaft will be enlarged. J. A. Kirby of Salt Lake City, Utah, is president and manager.

The number of men at the Sterling mine was increased this week, to prepare for putting in the machinery, including compressor and drills. The Sterling mines are in Willow Valley, between the Le Compton and Federal Loan mines.

PLACER COUNTY.

H. M. Jarvis of Damascus is operating the Bob Lewis No. 2, and has about forty men employed.

It is reported that the Annie Laurie mine has shut down for lack of water.

SACRAMENTO COUNTY.

The dredger of the Ashburton M. Co., a few miles from Fair Oaks, on the American river, was burned last week. The fire had its origin in one of the electric motors. The dredger was valued at \$75,000.

SAN BERNARDINO COUNTY.

W. Smith, I. Reynolds and S. Alf report finding gold ore a few miles north of Bagdad last week and located thirty claims. Negotiations are reported under way with the owners of the Bagdad group for a bond on the group.

Manager E. H. Stagg reports having men at work putting up the mill and cyanide plant at Barstow to handle the ore from the Bagdad mines.

SAN DIEGO COUNTY.

Oil is reported struck last week in the Yuha well, on the desert side of the Cuyamaca range, east of San Diego. Superintendent Swallow says it is making six barrels a day, but they will go deeper.

SANTA CRUZ COUNTY.

C. D. Dentworth, an oil operator in the San Joaquin valley, proposes to begin operations near Watsonville. He has secured 1248 acres in the foothills north of the Gaffey district, and including portions of the Rossi and Majors ranches, and will begin prospecting for oil this month.

SHASTA COUNTY.

The Balaklala Con. Co. has increased its holdings by the location of a number of additional claims, through W. W. Adams, superintendent, including the Vermouth, Vassar, Virgil, Vessel, Vixen, Vermont, Virgin and Vichy quartz mines and the Sapolio placer mine in the Flat Creek mining district, near Redding.

At the Shasta May Blossom group in the mineral belt a mile northwest of Bully Hill, near Winthrop, Superintendent C. S. Osborn says development work will be increased this summer. The tunnel in the Grant mine of this group is in 212 feet and at depth of 100 feet. Additional track and ore cars have been put in.

SIERRA COUNTY.

At the Twentieth Century mine, formerly the Mountain View mine, 4 miles east of Forest City, the tunnel has been extended 60 feet across the channel, in pay gravel. The mine is under bond to the Twentieth Century M. Co. of San Francisco, J. D. Hoff manager. T. E. Edwards of Forest is superintendent.

SISKIYOU COUNTY.

J. McBride of New York is setting up his quartz mill on north fork of Humboldt creek, near Hawkinsville, and operations are expected to resume this month. A tunnel will be run.

A. C. Brokaw reports having unwatered his quartz mine in Quartz valley, near Fort Jones, and operations resumed. He also proposes to begin work at the Golden Eagle mine on Indian creek. The shaft down 70 feet will be extended to depth of 300 feet.

Superintendent J. B. Scott at the New York mine, on Indian creek, 7 miles from Fort Jones, has fifty men at work. They will sink a shaft to cut the tunnel, which runs 2000 feet into the mountain, and it is intended to extend this shaft 500 feet below the tunnel level. A compressor, hoist and two motors are being put up and will be run by electric power from the Churchill plant. They are crushing 650 tons of ore per month.

TRINITY COUNTY.

The Layman quartz mines, 3 miles southwest of Hayfork, have been bonded to A. J. Van Matre of Sacramento for \$50,000. There are five claims in the group. The ore body is said to be a contact vein between porphyry and quartzite. There is a tunnel 180 feet in length giving a depth of 60 feet on the vein. The ore is free milling and samples native gold. Van Matre will begin sinking a shaft 100 feet in depth from the face of the drift on the ore body.

TUOLUMNE COUNTY.

At the Norwegian mine, near Tuttle-town, grading is finished preparatory to increasing the mill to ten stamps.

The Shawmut mine, near Chinese, is running steadily and 260 men are at work. The new furnace at the chlorination plant is in operation.

The cyanide plant at the Rawhide mine, near Jamestown, is being enlarged, and will have a capacity of 100 tons a day.

The Stockton Gravel M. Co. has men cleaning ditch and repairing flumes at Spring Gap, near Jupiter, to get water from the South Fork of the Stanislaus river. The Star mine, 10 miles east of Columbia, on Rose creek, near Jupiter, is running steadily and ten stamps are dropping in the mill.

A bond for a deed in the Blue Eagle mine, in Jawbone district, east of Groveland, has been given to G. F. Beveridge of San Francisco for \$10,000.

The Hiapoo, east of Columbia, has been bonded by W. Divoll and operations are in progress.

After a run of 600 feet in the Morris tunnel, making a total length of 1100 feet from the opening, the ledge was struck last week in the Birney-Wainwright claim

near Columbia. For 100 feet the companies will work together and then the tunnel will branch to the different claims.

YUBA COUNTY.

The quartz mine owned by G. Smet-hurst, 2 miles northwest of Brown's Valley, is being unwatered.

COLORADO.

BOULDER COUNTY.

Yockey & Merrifield have secured the right of way through the Uncle Sam tunnel, near Eldora, and are driving it to cut the Gold Coin, on which they have a sub-lease. They expect to cut the vein 100 feet below the bottom of the shaft, says the Miner.

CHAFFEE COUNTY.

Three shifts are sinking the working shaft on the Anaconda mine, near Turret, to the 200-foot level, where a station will be cut and a crosscut run south to open up the vein, which was struck by a prospect shaft farther to the east—Superintendent Heaton of the Par Value Co. is increasing development work on the Gold Bug mine.

CLEAR CREEK COUNTY.

The U. S. Geological Survey has begun preliminary work for the Georgetown Quadrangle, with H. L. Baldwin in charge. Triangulation stations have been established, one between Georgetown and Mt. Evans, another on the summit of Republican mountain, one on Big Chief mountain, one near James peak and two near Central City.

Manager W. Jewell reports making arrangements to erect a jigging plant at the Farwell mill at Georgetown to save the zinc values which were formerly thrown out.

S. T. Grant & Co. are shipping ore from the Bush and Norman dumps, near Silver Plume, to Idaho Springs for concentration.

The Dewey & Wheeler concentrating mill at Georgetown has been sold to the company operating the Centennial mines.

Manager Rogers of the Hazleton Co., operating the Baltimore mine, says machinery is being put in place and it is proposed to build a concentrator this summer.

GILPIN COUNTY.

C. A. Noack of St. Louis, Mo., bought the Baer group of claims, on the north slope of Colorado hill, last week. The group adjoins the Helen group on the south side of Black canyon, near Central City, and will be developed by a tunnel to be run in on the vein of the Baer lode No. 9. Operations will begin next week.

The Hall lode in Russell district, near Russell Gulch, was sold last week to S. D. Hanna of Texas. A heavier hoisting plant will be put in and sinking resumed.

J. S. Walters has a lease and bond on the Evergreen mine, east of Apex, which is owned by Mississippi men, and has cleaned out the main tunnel. He intends to sink a shaft. The ores carry values in copper and silver.

Additional machinery is on the ground for the Four Mile Gulch T. M. Co., near Black Hawk, including a 22 H. P. gasoline hoisting plant. It is being set up on the Democrat mine, on Dory hill, in Enterprise district. The shaft is 100 feet deep and it is intended to sink to a depth of 500 feet, which will make connection with the Bryan tunnel workings. J. Brohl is superintendent.

The Viola G. M. & D. Co. has resumed operations on its group near Russell Gulch. They have a group of seven claims and have begun sinking on the Silver lode. Their group is west of the Wal-tham group and east of the Old Town group. A small steam plant will be put in for temporary use, says Superintendent R. Hastie.

GUNNISON COUNTY.

Five miles west of Pitkin the Raymond group of mines is under lease and bond to W. Maher and E. M. Lamont. Instead of continuing the old workings they propose developing the entire series of lodes by a crosscut tunnel which has been driven 400 feet from the level of Ohio creek. This tunnel will cut the Midnight vein at distance of 900 feet, the Monte Carlo at 1300 feet and the Raymond at 1700 feet, attaining a vertical depth on the last of 1200 feet. Four hundred feet of additional driving will cut the Alexander, also belonging to the company, which has not been developed at the surface. All the veins are wet, which caused cessation of work in the original shafts and drifts. The main values are in gold, with some lead and silver. The ore body in the Midnight is 3 feet wide and in the Raymond 4 feet.

HINSDALE COUNTY.

The Hinsdale M. Co., owning twelve claims 3 miles north of Lake City, are driving a crosscut tunnel to open up the Monumental mineral zone at 2200 feet. It has twelve veins located on the surface.

The Bon Homme Co., near Lake City,

are preparing to put up a reduction plant. They have a body of milling ore blocked out.

C. W. Roe has a lease on the Happy Thought dump, near Lake City, and has men at work overhauling his concentrating mill, expecting to have it in operation by June 1. The power for running the mill will be furnished from the Big Kan-aga battery of boilers.

The Captive Inca Co.'s shaft, near Lake City, is down 100 feet. They will put in a plant of machinery this month. W. G. Boyle is manager.

LAKE COUNTY.

Manager H. Manlock of the Doris mine has a lease on the entire Long & Derry group, in Iowa gulch, near Leadville, and will operate that in connection with the Doris. He began work this week.

Ames, McCollum & Son & Carter, owning the Tiger mine, in Iowa gulch, have begun increased development work. The Tiger mine has been worked through a shaft at the northern end of the claim. The vein has been found in a 150-foot tunnel starting from the Ontario, to the south of the Tiger. It is intended by the owners to continue this tunnel through the Tiger and cut the shaft at a depth of 600 feet.

Manager E. A. Hanfen of the Louisville mine at Leadville proposes to unwater his shaft by running a tunnel on the 700-foot level to tap the Yak tunnel, and then pump the water into the tunnel. Workings are at present confined to the 600 and 700-foot levels.

Developments in the Yak tunnel are reported to have shown that the copper sulphide shoot of the Moyer extends as far west as the Minnie Lee.

Work of retimbering the shaft of the Mikado mine, near Leadville, is progressing, and it is expected by June 15 ore shipments will resume. At the 1000 foot level there is a body of zinciferous ore which will be mined and shipped to Canon City and Kansas. In addition to this work, prospecting will be carried on in other levels to locate a sulphide body, says the Leadville Dispatch.

Leadville advices say there is such a strong demand for the better grade of zinc that the mills in the camp are running full capacity and treating 400 tons of crude ore per day. At the Moyer all the low-grade ore is sorted by hand, which is found to be rather expensive, so the mill will be supplied with additional machinery. At present the mill is supplied with rolls, which will be taken out and Huntingtons and concentrating tables put in.

At the Greenback mine, near Leadville, operations will resume this week. The Rialto group of mines in Graham park has been leased to B. Mulrooney, owner of the Greenback. The ground is in Breese Hill district and will take in all of the claims of the Rialto M. Co., giving the new company an area of seventy-five acres. It is intended to sink a shaft near the Rialto and work the northeast portion of the ground from the Greenback shaft, which is down 1300 feet.

LA PLATA COUNTY.

Another shaft has been started to sink 250 feet on the Comstock mine, near Durango. The Comstock is near the La Plata river. The old shaft is 200 feet deep and is in ore at the bottom as well as in two levels above.

The Happy Five M. & L. Co., of Colorado Springs men, operating the Small Hopes group near La Plata, are putting in an air compressor and boiler and expect to be in operation by June 15th. They will continue the crosscut tunnel into the Small Hopes vein, and will also work above the former tunnel level.

The North American M. & L. Co. of New York has bought a group of claims at the head of Madden and Bedrock gulches, near La Plata, and have men on development work. As soon as the ground is opened up it is their intention to build a mill. The ore carries gold and copper.

The Swamp Angel M. Co., of Durango and Denver parties, have begun operations on the Swamp Angel and Gold King claims at Oro Fino, near La Plata.

The Edith M. & M. Co. has been organized by Denver and Durango men, and has ten claims west of the Neglected mine near La Plata. They are putting in a hoisting and pumping plant on the Last Chance claim.

LARIMER COUNTY.

The Boston-Colorado C. M. Co. propose to build a smelter on their group, to cost \$50,000. C. R. Hall and R. Leshner of New York, with J. Macmillan and S. Stark, of Denver, are directors. The company has blocked out ore averaging 10% copper and \$4 per ton in gold. The company have 4500 feet on the main vein.

RIO BLANCO COUNTY.

Sixty barrels of oil were pumped from the Requena well, near Meeker, last week,

and stored in a tank, being an average accumulation of five barrels a day for the twelve days previous to the pumping.

SAN JUAN COUNTY.

D. Pettijohn of Silverton says he will resume work on his Hoosier Boy mine in Lime Creek section, near Silverton. He has opened up 4 inches of ore that runs \$5 in gold, 300 ounces in silver and 20% lead.

The reorganization of the Hercules Con. M. Co. has been completed, says Manager T. H. Kane, and the Little Dora mill and company's mines near Silverton will be started up.

There is being handled at the Silver Lake mill, near Silverton, daily an average of 260 tons of ore, which make 50 tons of concentrates. Two-thirds of the output comes from the Silver Lake mine and the balance from Unity tunnel. The concentrates average \$80 per ton, mainly in gold.

The Brooklyn mine and the Johnson & Lonne mill, near Silverton, were started up this week. The ore from the Brooklyn shipped last year to the smelter is said to have averaged \$80 per ton. Mannion Bros. & Murphy are owners. The ore will be packed from the mine to the mill, about a mile distant.

The San Juan S. & R. Co. has been incorporated by B. O. Read, F. W. McGaffey, G. H. Oliver, F. W. Kendrick, G. A. Marshall, F. N. Stiles, P. E. Houlette, W. F. Ford, F. Barnett, H. E. Dusenbury and F. A. Metcalf, to operate near Silverton.

SAN MIGUEL COUNTY.

The Davis Reduction Co. was incorporated last week by E. L. Davis, H. M. Hogg and M. Lehman to build a customs sampling plant near the mouth of Bear creek, near Telluride. They have bought the mining interests of C. Cromer, which includes a placer claim and water right.

The Smuggler-Union 60-stamp mill at Pandora, 1½ mile above Telluride, is running on company ore from the Smuggler-Union mines and treating 200 tons daily. The 80-stamp mill, 200 yards west of the new, is given over entirely to the treatment of lessee and custom ore. S. T. Elliott, foreman of this plant, G. E. Werner, G. Wearing and W. Brennan, who have a lease on the old workings and a block of new ground in the Sheridan mine, owned by the Smuggler Co. and adjoining the Smuggler claim on the north, are supplying the old mill with 100 tons of mineral daily, which keeps thirty of the stamps dropping. The concentrate shipments from the two plants and cyanide works—the free gold being caught on the mill plates by amalgamation—amount to 125 carloads per month.

It has not been decided just when the old Tom Boy mill, near Telluride, having a capacity of 225 tons daily, will be started, says the Denver Times. This plant has been idle since December, 1902, when the 60-stamp Tom Boy mill was completed and put in operation, there not being water supply enough for milling purposes for both plants during the winter; but it is expected to resume this month, as the snow is melting rapidly.

Under Manager C. Anderson, the Nellie and Ella mines, in Bear creek, near Telluride, are again taking out enough mineral to keep thirty stamps of the Bear Creek 120-stamp mill dropping. It is expected to increase the output this month.

SUMMIT COUNTY.

The Union Con. group, on Gold hill, near Kokomo, resumed operations this week, says Manager Gagan, principal owner.

TELLER COUNTY.

A lease and bond on the Forest Queen mine, on Ironclad hill, Cripple Creek, has been given to J. K. Walsh of Colorado Springs, who is putting in machinery.

The annual report of Manager F. M. Woods of the Doctor-Jack Pot Con. M. Co. at Cripple Creek shows for the year ending May 1, 1903, the following development work, practically all having been done by lessees: Drifts 1119 feet, cross-outs 557 feet, winzes 115 feet, raises 627 feet, total 2418 feet. On May 1 there were twenty leases in operation, seventeen of which were shipping ore. With the completion of the drainage tunnel the company expect to resume operations on company account. The tunnel will give them additional depth and drainage of 238 feet.

Pumping operations at the El Paso Gold King, up Poverty gulch, near Cripple Creek, last week reached the bottom of the shaft, 900 feet from the surface. Before this water course was struck the Gold King was producing 800 tons of ore per month that gave returns of \$25 per ton.

Operations were resumed last week on the Hoosier mine, on Tenderfoot hill, Cripple Creek. The Grafton Co., owning the property, leased the ground last month to J. K. Walsh of Cripple Creek, who has put in a compressor. W. E. Lloyd is superintendent. The terms of the lease require that the shaft shall be

sunk 200 feet during the first year and an additional 100 feet for each year during the balance of the five years of the lease. The shaft is down 478 feet.

The Modoc Co., operating on Bull hill, propose to put in a washing machine to handle their output.

A cyanide mill is being built on the Home Run mine on west slope of Squaw mountain, near Cripple Creek, and adjoining the Santa Rita mine. The Home Run contains deposits of low-grade oxidized ore.

This week the Portland G. M. Co., at Cripple Creek, put skips in operation in No. 2 shaft, replacing the double-decked cages. Two will be used and each skip has a capacity of three tons of ore, which is double that hoisted with the cages. The air compressor is expected to be in operation next week. It will have a total drill capacity of 110 drills. The majority of drills will be on development work.

It is reported the Wrockloff shaft on Burns claim of the Acadia Co. at Altman has been abandoned and the hoisting and other machinery sold.

The Bayard M. & L. Co. was incorporated last week at Cripple Creek, with A. H. Baldwin, W. W. Oaks, J. M. Hower, Jr., T. R. Roundtree and P. Busch directors.

The gold production for Cripple Creek district during the month of May reached \$1,695,415, a decrease from April of \$7235, says the Colorado Springs Telegraph. The tonnage was 48,650, 2400 tons less than April. The Globe mill at Goldfield began operations on May 10. The tonnage and values were distributed as follows:

	Tons.	Av. value.	Gross value.
Telluride mill....	4,500	\$30.00	\$135,000
Portland.....	8,000	30.00	240,000
Dorcas.....	2,750	35.00	96,250
Economic.....	3,500	24.00	84,000
Globe mill.....	400	6.50	2,600
Gillett.....	500	2.50	1,065
U. S. R. & R. Co.	17,000	24.50	416,500
Smelters.....	12,000	60.00	720,000

Totals.....48,650 \$30.00 \$1,695,415

The Accident group, on Gold hill, at Cripple Creek, adjoining the Pointer and Mint mines, has been bonded and leased to B. T. Hickman of Montana for \$50,000. Ore has been opened up in the 300-foot level 200 feet from the shaft.

IDAHO.

BANNOCK COUNTY.

G. B. Rogers, president of the Inter-Mountain G. & C. Co., operating a group of claims 7 miles east of Pocatello, says they are putting in a 40 H. P. engine and boiler on the ground, together with a hoist and pump. Work will begin on a 500-foot shaft. The ledge shows values in gold and copper.

BLAINE COUNTY.

I. E. Rockwell, manager of the Minnie Moore and the Idaho Con. M. Co., near Halley, says operations have begun on the Red Cloud and Contact groups of twenty-five claims that they have taken over. Some of these claims are on the Minnie Moore vein, some are on the Bullion-Deer Creek divide, and some on Red Cloud hill.

BOISE COUNTY.

Manager Rogers and Michigan men have organized the Black Pearce M. Co., to take over the Emke group of mines near Pearl, which they have under bond. The workings consist of 150 feet of shaft and 300 feet of tunnel. They will sink the shaft to the 300-foot level and continue work in the tunnels. R. Anderson is superintendent.

Turtle, Alexander & Lykow, owners of the Jumbo group, in El Dorado gulch, near Idaho City, have bonded the Chickahominy mine.

CUSTER COUNTY.

A company has been organized by F. A. Stacey, G. W. Stewart, W. W. Adamson, F. C. Brennan, E. R. Sherman and Condat & Wise to operate the Sunnyside and Victor mines, on White Knob Mt., 7 miles from Mackay, says the Telegraph. The vein is a contact between lime and porphyry and carries values in copper, gold and silver. They have begun development work.

C. Crane of Salt Lake City, Utah, manager of the Bull Dog mines, near Custer, reports the group under option to Eastern men.

IDAHO COUNTY.

(Special Correspondence).—The Moose Creek Placers Co. report opening new ground this season. Their water supply will be lower than normal, but recent improvements have reduced the cost of operating. Last week 115 43 ounces of bullion, value \$2200, was obtained from ten days piling, with bedrock, races, lowest of three sluice lines, and both undercurrent tables yet to be cleaned.

Newsome, May 31.

J. Jewell, superintendent of the Gold

Reef Co., near Roosevelt, in Thunder Mountain district, says he has run 400 feet of crosscut tunnel and has opened up the ore body. Thirty men are at work on the Dewey and the mill is running. Thirty men are working on the Sunnyside blocking out ore for the mill which will be built this summer. On the Wordenboff two shifts are running a crosscut in ore. C. Brewer, H. Babendorff, et al., are developing the Golden Slipper group and driving a tunnel to tap a 22-foot vein at depth of 90 feet. The vein runs \$6 in gold and twenty ounces in silver on the surface. The mill on the Paymaster on Big Cottonwood creek is running steadily.

KOOTENAI COUNTY.

Near Tyson, the hydraulic plants on the Nellie, Mornford and Harding claims are at work, with good heads of water, and the daily yield of gold dust is reported at \$700. It is expected the water supply will last another month.

OWYHEE COUNTY.

The work of unwatering the Afterthought mine, on War Eagle Mt., near Silver City, has been finished and a contract let by the DeLamar Co. for sinking the shaft an additional 300 feet—a total of 600 feet. The mine will be proven to that depth before running the tunnel from South Sinker gulch will be begun. The proposed tunnel would cut the vein at depth of 1000 feet.

T. B. Hall and F. T. Clemmens of Colorado have an option on the Miller & Walters mining group on the eastern point of Florida mountain, near Silver City. They propose starting an adit tunnel at the north end of the claims on Black Rock gulch to cut under the present workings, which consist of a 500-foot crosscut tunnel opening the veins from the east side, and drifts running north and south, each 300 feet long, from which some ore has been milled running \$25 per ton.

S. B. Longfellow of Ohio has bought the Homestake mining property, near Silver City, and has let a contract to run 200 feet of a tunnel, which at 400 feet will cut 150 feet under the shoot of ore found near the surface. Superintendent Gerling will continue drifting on the vein above.

SHOSHONE COUNTY.

The St. Louis & Idaho M. & M. Co., operating a group of three claims near Burke, are incorporated, with R. J. Collins, I. S. Collins, E. & G. D. Collins and D. B. Barbee.

The Reindeer M. Co., near Mullan, are putting in an air compressor, says President Strode. It is a belt machine driven by water power, with a capacity of 165 feet of free air per minute. The company's water power has a head of 477 feet.

WASHINGTON COUNTY.

C. R. Spear, at the Gold Coin cyanide plant at Black Lake, near Council, says they are working fifty tons per day. A rock crusher, with capacity of 150 tons per day, is in operation, and it is proposed to increase the entire plant to that capacity. They have twenty men at work.

H. W. Reeth of San Francisco, Cal., is reported to have bought the Sommers group of fourteen claims at Mineral for a European company. They propose to build a smelter on Snake river and transport ores to the smelter by an electric road or an aerial tramway.

MICHIGAN.

HOUGHTON COUNTY.

The State Legislature has passed a bill appropriating \$45,000 for the Michigan College of Mines at Houghton for the construction of a metallurgical laboratory. Cyaniding and wet methods of concentration will be exemplified in the equipment and electrometallurgy will receive special attention. It is intended to put in furnaces of larger capacity than is usual in college laboratories. The board of control of the college is taking steps to create a separate department of ore dressing and metallurgy.

The Mesnard, or No. 3 shaft, of the Quincy mine, at Hancock, is sinking from sixteenth to seventeenth level. The first level is 250 feet, the others 125 feet apart. At present rate, it will take two years to reach the bottom stop from No. 6 Quincy and to connect with remainder of mine. The Franklin comes in between on the lower levels, Quincy having been driven out to north of Franklin and stopes opened below site of Mesnard shaft, which ultimately is to operate these workings. The Mesnard is being opened as a mine and drifts are being extended north and south. An average of eight carloads of mineral rock are being sent to mill. The northernmost workings from the Mesnard are 1½ mile from the south drifts of No. 6 shaft. The latter is 4900 feet deep.

Houghton reports say, this month will

mark beginning of a further increase in volume of lake copper production, as four additional stamps are to go into commission, of which Osceola will furnish two, and Trimountain and Phoenix one each. The Osceola, at North Kearsarge, is nearly ready for operation, and before June 1st the mine should be supplying seven stamps.

The dry wall and filling method used successfully in the Baltic mine, near Houghton, is being introduced at the Winona mine at Winona.

The management of the Arcadian mine, near Hancock, has discontinued shipment of rock. Actual mining operations will cease, but the work of testing the ground by diamond drill and the sinking of the southern shafts will be continued under Superintendent Sbiels. The stamp head released by stoppage of Arcadian shipments will be used by the Trimountain mine.

The Franklin M. Co., near Hancock, will put in the third head of stamps at its mill, and it is expected that it will be in operation by August 15.

Work on shaft No. 3 at the Winona mine at Winona is under way. It is 1650 feet south of No. 2 shaft and sinking and raising from the fourth level south of the No. 2 shaft will expedite its opening.

It is reported that the Globe mine, south of the Champion mine, at Painesdale, is to be opened by a shaft this summer. J. Stanton is principal owner.

At the Trimountain mine, near Houghton, this month they expect to begin taking out a full rock supply daily to all four heads at the company's new stamp mill. They have been handicapped on account of delayed mining and milling machinery. Equipment for shafts No. 2 and No. 3 has not yet arrived. The No. 1 is the only permanently equipped shaft, but the mine is supplying 1700 tons of rock daily.

At the Red Jacket shaft of the Calumet & Hecla Co. at Calumet ample power is available for hoisting, but at present the maximum capacity of the four compartments is said not to exceed 1200 tons daily, working twenty hours. The water from the Calumet branch of the mine is hoisted through the Red Jacket shaft, the work engaging the entire services of one of the hoisting engines. The other engine does the hoisting of rock for the two compartments of the shaft, the output of which is 700 tons of rock daily.

The necessary changes in the shaft, and also in the rock house, to permit of the substitution of the skips for the cage system, are expected to be completed by August 1. Bins are being provided at each alternate level at either side of the shaft, commencing with the fifty-seventh. In all, nine of these will be used, and their capacity of nine tons will be similar to that of the new skips now being gotten in readiness. Skips will be box-shaped and in the matter of lowering and hoisting there will be no deviation from present methods. The advantage anticipated is a substantial saving in time in loading and unloading, as it is believed three skips can be operated, compared with two cages under existing arrangements. The engines are capable of hoisting a ten-ton load at the rate of 3600 feet per minute, and allowing for reduced speed at the top and bottom of the shaft, the round trip to the extreme depth can be made in five minutes. The capacity of the Red Jacket shaft, beginning August 1, is expected to be not less than 1800 tons daily, and if the company is planning an increased production, there is more likelihood of the additional rock shipments being forwarded from this source than from the several idle shafts on the Osceola lode, which, in the past, have shown low mineral values (less than 1%, even after a fair rock selection).

ONTONAGON COUNTY.

The management of the Mass mine at Mass City is awaiting the convenience of the Michigan Co. to turn over a head in the mill to the latter. Should the Michigan decide to build a mill also at Keweenaw bay, the Mineral Range Road will extend its tracks to the Michigan mine; otherwise the Michigan will have to deliver cars to the Mineral Range over the St. Paul Road, thus increasing the cost of transportation, says the News.

MONTANA.

FERGUS COUNTY.

The Gold Reef M. Co., at Gilt Edge, have opened up a body of ore on the Chicadee and Peerless claims of the group. The company has twenty men on prospecting and exploration work. They also have men building the roasters and it is expected the roasters will be ready for operation by August 1st. The mill has a daily capacity of 150 tons. When the mill run is resumed the output of the roasters will be mixed with the oxidized ore and pass through the mill for treatment, a better treatment of the black ore being thus secured and the steady oper-

ation of the mill insured, says N. J. Littlejohn of the company.

GRANITE COUNTY.

In Georgetown district, near Phillipsburg, the Southern Cross mine is being worked by L. Evans of Butte under lease and bond. Mr. Evans was in the mine last week and put a crew of men to work. Considerable dead work is to be done before much ore can be taken out, but it is expected by July some ore will be ready for shipment to the smelters. The Southern Cross adjoins the Cable mine on the west, and at present low-grade ore is being worked in the mill. It is proposed to put in a cyanide plant.

At the Cable mine, 1½ mile east of Phillipsburg, prospecting is being done by a diamond drill. The ore bodies continue to the depth so far reached by the drill, the ore samples obtained being free-milling. Work is progressing on the improvements at the mill. It is the intention of the company having the lease to overhaul the mill, remodel it and increase its capacity.

Plans are being drawn by the Granite-Bimetallic Con. M. Co. for their reduction works near Phillipsburg. It is thought a smelter will be built. The company own a smelter site at the mouth of Boulder creek, near Flint station.

JEFFERSON COUNTY.

An Eastern company, H. Frylor of Corbin manager, has bonded the Gaffney group of mines, near Wickes, for \$30,000. The group consists of six claims and the ore is principally copper and silver of a concentrating grade. A 100-ton concentrator will be built near the mine.

Shipping ore assaying \$35 a ton is reported struck in the Daly mine at Wickes. M. R. McGee, manager for an Eastern company, who relocated a mine near Wickes, reports a body of oxidized iron ore which contains native copper.

The Montana Ore Purchasing Co., operating the Katie concentrator, near Basin, is making plans for the enlargement of the mill for machinery to increase the capacity. The mill is concentrating 1000 tons of ore per day, and it is stated this will be raised to 1500 tons.

D. J. Sweeney, operating the Silver-smith mine, near Basin, under lease and bond, says shipments are being made regularly from this property which run \$3000 per car.

W. A. Kidney and A. Ray have a lease and bond on the Comstock mine in Cataract district, near Basin. It is the intention to put in machinery and resume sinking the shaft.

Several feet of ore, averaging \$25 a ton, are reported struck in a crosscut from the 300-foot level of the Daly mine at Wickes. It is proposed to concentrate the ore this summer, and the mill at Corbin, several miles down the valley, will be utilized for that purpose.

The Cataract M. Co. propose to build a 200-ton smelter at Basin, work to begin next week. The Cataract Co. has done 9000 feet of development work on its claims and 4000 tons of ore have been shipped.

MADISON COUNTY.

The Granite Mountain M. Co., owning fourteen claims in Summit district, near Virginia City, has resumed development work after an idleness of ten years.

POWELL COUNTY.

In Red Lion district, between Danielsville and Cable, the Barton and Jones group of claims at the head of Warm Springs creek is bonded to the Montana M. Co. of Marysville for \$40,000. There are three adjoining claims. The main shaft is sunk on the lead to depth of 180 feet, and the lead is crosscut in the shaft at 80 feet, 120 feet and 180 feet depths, showing 34 feet wide. The values are in free-milling gold. The mine is on the contact between granite and quartzite. Fifty feet from the main shaft on the Barton and Jones there is a parallel vein 2 feet wide, assaying \$40 in gold.

PARK COUNTY.

It is reported the Montana Coal & Coke Co. are planning to open up the O'Hearn mines, west of Aldridge, and to take the greater portion of the coal for coking. A terra cotta pipe will be put in from the mines to Horr and the coal will be crushed and washed and floated down to be coked, says the Butte Intermountain.

NEVADA.

ELKO COUNTY.

J. J. Driver, H. Hussey et al. of Ogden, Utah, are working the Eclipse mine at Tuscarora.

STOREY COUNTY.

The electric hoist at the Andes mine, near Virginia City, has been completed and work resumed.

A 50 H. P. electric hoist is being set up on the Brunswick lode, near Virginia City, at Shaft No. 1.

WHITE PINE COUNTY.

Superintendent Shaw of the New York & Nevada C. M. Co., whose mines are at Copper Flat, near Cherry Creek, has placed a boiler and engine on the No. 2 shaft and put on more men, sinking a shaft to connect with the 400-foot level. He is also sinking a three-compartment shaft.

Last week the Jupiter group of gold and copper bearing claims, near Ely, were sold to the McKinley M. & S. Co., says W. N. McGill, local manager.

NEW MEXICO.

GRANT COUNTY.

The remodeled smelter of the Shamrock G. & S. Co., near Pinos Altos, resumed operations last week. The power drills in the mine are in operation. The Shamrock plant will handle custom ores in addition to the output of the mines of the company, among them being the Silver Cell mine.

The Houston-Thomas group, near Pinos Altos, have been sold to C. A. Stevens of New York. There are three claims in the group, which is developed by tunnels. The ore carries gold and silver.

The American Con. C. Co. continues work on the Atwood mine in Shakespeare district, near Pinos Altos. One shaft is down 360 feet and yielding forty tons of ore daily, running in copper, gold and silver. Another shaft is producing twenty tons of ore per day. The leaching process will be used on some ore as soon as the leaching plant is finished. The smelting ores are being sorted out and shipped.

C. R. Luton, manager of the Michigan-New Mexico C. M. Co., operating in Shakespeare district, and of the International G. M. Co., owning a group in Malone district, 14 miles north of Lordsburg, says work on the properties of both companies is being done under W. H. Stevens, superintendent of both companies. A strike is reported in the Dacotah Pearl and Carbonate claims of the Michigan-New Mexico Co., showing average of \$12 per ton.

RIO ARriba COUNTY.

The Keystone M. Co. has decided to build a smelter on its properties in Bromide district, near Tres Piedras, Taos county.

SIERRA COUNTY.

At Fairview, the New Era mine is shut down, the company having decided to operate a property at Kelly, of which it is owner.—At the Silver Monument mine, says Manager Phillips, a tunnel will be started near the mill to strike the vein on the Cuba Libre and along through that property to the old workings of the Monument.—Phillipsburg, the new camp below Kingsburg on Poverty creek, is reported improving. The mill and cyanide plant for the Minnehaha mines are building. The main shaft is down 60 feet, and levels are being run north and south at 57 feet.

TAOS COUNTY.

Superintendent J. P. Rinker of the Keystone C. M. Co., which has nineteen mining claims in the Bromide district, 12 miles from Tres Piedras, says work is progressing on the Pay Roll, the principal claim, on which a shaft of 250 feet is sunk. The vein averages 18 feet in width and a shoot 4 feet thick is being worked, which assays \$15 in copper, gold and silver.

OREGON.

BAKER COUNTY.

Preparatory to putting up their mill, Superintendent P. A. Brady of the Belcher mine, near Sumpter, is getting ore blocked out. He is raising from the Belcher tunnel in shoot No. 3 and also driving this tunnel ahead to reach the point where the Golden Gate vein crosses the Belcher. The 500-foot tunnel being driven on the Golden Gate has opened an ore shoot showing 3 feet of milling ore. The raise from the third shoot in the Belcher tunnel will give backs of about 500 feet. The mill will be below the mouth of the Belcher tunnel.

L. V. Swiggett, manager of a Portland company, last week bought the west extension of the Crown Point, Cable Cove district, near Sumpter. There are two claims in the group. A shaft will be sunk to open up the vein and drifts extended. Manager C. P. Barrows, of the Maid of Erin mine, located on lower Powder river near Sumpter, has put up a 10 stamp mill, which will be operated by water power, water being taken from the main stream, 2½ miles above. The mine is owned by a company of Buffalo, N. Y., men.

Sinking operations are temporarily suspended at the Golden Wizard mine near Sumpter, says Manager J. M. McPhee, to prepare the upper levels for a mill. In the upper workings they are blocking and driving the main tunnel ahead. It is quite expensive to handle the water and they have concluded to build the mill to make the mine pay for its own develop-

ment. One tunnel has been driven on the vein 312 feet, and 150 feet of crosscuts made from it, proving a vein 40 feet in width. It is intended to continue this tunnel 300 feet farther on the vein, which will give a depth of 275 feet. One hundred and twenty feet below the main tunnel a station has been cut and drifts and crosscuts run from it. The ore body averages \$10 in gold. A plant with both stamp and roll crushing, for concentrating and amalgamating, will be erected, of either 10 or 20-stamp capacity.

The Big Creek G. M. Co., of Whitney, has been incorporated by B. Miller, J. W. Copeland, J. D. Grove and M. K. Young. The holdings of the Big Creek Co. include nine claims between the Morning and the Snow Creek mines in Greenhorn district. They have men at work driving a crosscut for the Snow Creek and Morning ledges.

T. J. Simmonds, manager of the Morning mine in Greenhorn district, near Sumpter, says their Bryan mill was put in operation this week. The mill has a daily capacity of thirty tons. The upper workings are being timbered.

The "boom" method of placer washing is being used at Buck Gulch, near the summit of Granite divide, near Sumpter, says the Blue Mountain American. C. A. Pray is superintendent. A small dam is built in the stream above where washing is to be done. An exit for the water is made, and into this is fitted a gate that is opened by the rising water and closed by its own weight when water recedes—result being an alternate flushing of stream channel below with such force as to make effective current. Riffles are arranged for gravel handled to pass through, and by the aid of men the main channel is kept free of heavy boulders that interfere with washing. No one is required to handle a nozzle or to attend the reservoir. Every ten to fifteen minutes the gate opens and, night or day, this washing proceeds, the gate, after opening, slipping down into position, because float regulating it has been lowered.

Manager Reed of the Auburn Deep M. Co. says their hoisting plant is in operation on the Auburn placers on Poker Flat, near Auburn. Pumps also have been put in.

GRANT COUNTY.

W. E. Saunders, C. S. Miller, L. Walker, A. Mohr, J. M. McPhee, of Sumpter, and C. E. Peterson, of Tacoma, Wash., are reported to have organized a company to explore the coal lands in John Day region. They have 1108 acres of land covering portions of the coal fields as exposed by the outcrops of the seams, on the John Day river, 75 miles below Canyon City.

At the Alamo mine, at Alamo, Superintendent McGuigan says an intermediate tunnel is being driven between tunnels Nos. 2 and 3. A body of ore has been opened up and the mine has backs of 400 feet.

JACKSON COUNTY.

Superintendent J. P. Harvey of the Blue Ledge C. Co. of Upper Applegate, on Joe creek, near Jacksonville, says a diamond drill outfit is being set up to prospect their ground. The Blue Ledge Co. has fifteen men at work on two tunnels they are driving at the main ledge.

JOSEPHINE COUNTY.

A strike of copper ore is reported on Collier creek, in Lower Illinois River district, near Grant's Pass, by F. Reed of Roseburg, et al. Some of the ore shows native copper. The find was made in the Collier creek country, 18 miles south of Rogue river and west of the Illinois river, of which Collier creek is a tributary. Sixteen claims were located.

WALLOWA COUNTY.

A 20-stamp mill will be built on the Tenderfoot group, says President E. R. Tripp of the Tenderfoot G. M. & M. Co. Their mines are 18 miles south of Joseph. A cyanide plant for the treatment of tailings will be erected at the same time. The Tenderfoot group consists of twelve full claims.

SOUTH DAKOTA.

CUSTER COUNTY.

The Ohio-Beaver Creek M., M. & D. Co. has been organized with T. C. Lentz, of Columbus, Ohio, president, to operate a group of claims on the headwaters of Beaver creek near Pringle.

LAWRENCE COUNTY.

The Sunbeam mine, near Hill City, has suspended operations to put in an air compressor. The shaft is down 300 feet, with stations cut at the 100 and 200-foot levels. It is reported the company will begin building a 100-ton stamp mill this month.

TEXAS.

CHEROKEE COUNTY.

Austin reports say that pursuant to the decision of the Board of State Peniten-

tiary Commissioners the Iron Industry at the State Penitentiary at Rusk resumed last week. About 500 convicts are to be employed in the manufacture of pig iron and iron pipe.

UTAH.

In the ore and bullion market the month closed on settlements aggregating \$1,561,300, this total independent of settlements on the output of copper, gold and silver-bearing bullion which was forwarded from the furnaces of the independent smelter, says the Salt Lake Tribune. The output reached approximately 80,000 tons, with the usual volume of ore going to outside plants—being a slight shrink from the April product: Crude ores and concentrates, \$742,200; base bullion, \$662,700; gold bars and cyanides, \$206,000. The settlements for the week ending May 30th aggregated \$709,300. The shrinkage is accounted for in the interruptions at two of the valley plants.

BEAVER COUNTY.

Manager W. A. Farish of the Majestic C. Co. says the O. K. mine, near Milford, will be equipped with a 300-ton concentrating plant, which will be built this summer. The directors have also decided to connect all of their mines with the smelter with their own railway system, which will be of 2-foot gauge.

GRAND COUNTY.

L. Taylor, part owner of the Big Indian group of copper mines near Moab, reports a strike made in the Blue Jay group owned by J. Skewes of Salt Lake City, superintendent of the Big Indian. The Blue Jay group is a north extension of the copper-bearing zone on which the Big Indian is located. Seven feet of ore were opened up, showing azurite and malachite. The Big Indian is still idle, pending its equipment with reduction works, says Taylor, although the usual amount of prospecting is going on.

IRON COUNTY.

W. F. Baker of Denver, Colo., has a bond and lease on the Rice group of eight mines on Rice hill, near Stateline, for \$30,000.

The Johnny mill at Stateline is crushing thirty-three tons of ore daily, and the directors have decided to add ten stamps more. There are forty-five men at work in the mine and mill. W. J. Dooly is manager.

JUAB COUNTY.

Near Eureka sinking has been resumed in the incline in the Eagle & Blue Bell mine, which is 600 feet deep. The mine is being developed by the Bingham Con., which holds an option on it.—The May Day shaft is to be deepened 100 feet. A station has been cut on the 200-foot level and a donkey hoist set up. From that point the shaft will have two compartments.

SALT LAKE COUNTY.

It is reported that C. M. McNeill, manager of the United States M. & R. Co., has an option on De Lamar's one-fourth interest in the Wall-De Lamar group, near Bingham.

Superintendent W. J. Craig says connection was made between the upper and lower sections of the Yampa tunnel at Bingham. The Yampa has 6500 feet of development, including the 1700-foot incline (on the dip) and Yampa (upper) tunnel, 1500 feet along the vein.

Superintendent A. Mayberry of the Old Telegraph, Old Jordan and others at Bingham reports developments on the Silver Shield mine progressing. Franklin tunnel on Niagara ground has been extended into Silver Shield territory for 80 feet.

The C. Peterson holdings in the Madsen G. M. Co. of Salt Lake City have been sold, by which the Trapper's Pride group on Gold mountain were transferred to R. W. Madsen and W. A. Worthing for \$30,000.

SUMMIT COUNTY.

The Daly-West, at Park City, beginning June 1st, made an increase in the schedule of wages to the following: Miners, \$3 per day; muckers and carmen, \$2.75. This raise was unsolicited.

The Wabash option on the Storey group of mining claims at Park City, owned by P. Shanley, has been allowed to lapse.

Superintendent J. S. Free of the Park City G. & S. M. Co. states the shaft is down 200 feet and a crosscut started to locate the ore bodies.

To operate the St. Louis and Vassar groups of mining claims, near Park City, the St. Louis-Vassar M. & M. Co. has been incorporated at Salt Lake City. The group is 2 miles southwest of the Quincey mine of the Daly-West holdings. In prospecting the group a tunnel was driven to the contact, opening up ore that afforded 89 ounces silver and 24½ lead, with values in gold. Of this class of ore there is exposed 2 feet. The same channel has been tapped on its dip 90 feet below the tunnel level. M. Shaughnessy, R. Gorlinski,

J. R. Walker, J. Hogle and T. F. Singler are directors.

TOOELE COUNTY.

Work has been resumed on the Buckhorn group of mines on the ridge between Ophir and Dry canyon, on which P. S. Kimberly & Co., of Salt Lake City, have an option. It adjoins the ground of the Ophir Hill and Montana M. Companies on the north.

C. Rooklidge, superintendent of the Queen of Sheba's mine and mill in Deep Creek district, near Ibadah, says development work is progressing and dropping five stamps in the mill, handling fifteen tons per day. It is expected to increase the capacity next season.

The tailings plant at Manning, near Mercur, belonging to the Con. Mercur M. Co., is in operation.

UTAH COUNTY.

An iron mine east of Santaquin, in the foothills, is being opened up by a Salt Lake company, with W. T. Openshaw of Santaquin as superintendent. The ore is of a quality for fluxing purposes.

WASHINGTON.

FERRY COUNTY.

The Mountain Lion G. M. Co., near Republic, are shipping ore over to Grand Forks, B. C.—The Lone Pine-Surprise continues shipments. They have thirty-six men stoping ore in the Lone Pine workings.—W. M. & F. Crummer have a lease on the Black Tail mine and are stoping ore.

The tunnel of the Belcher mine, near Republic, is reported to have crossed the main lode of the mountain for 50 feet. It is proposed by the Belcher Co. to start another tunnel from a point lower down, which will give an additional working depth on the vein of 150 feet. The Belcher Co. has bonded additional claims adjoining the Belcher mine for \$5000 from the Iron Belt M. Co. J. L. Harper has bonded the Bigham and Moody group on upper Lambert creek, near the Belcher mine.

Manager Ridpath, owning a controlling interest in the Lucille Dreyfus mine, near Danville, says it is his intention to run a 1400-foot tunnel to tap the ledge at depth of 600 feet. As soon as a railway siding is put in, ore shipments will be made to the smelter.

LINCOLN COUNTY.

W. A. Crawford, operating the Van Horn group in Cedar Canyon Camp, near Davenport, says he has struck the ledge in the tunnel, showing 20 feet of free-milling gold ore.

OKANOGAN COUNTY.

(Special Correspondence)—At the Bonanza Chief mine, in Slate Creek district, near Mazama, a lead 9 feet wide, showing free gold and tellurium, has been opened in the tunnel.

The Mammoth people are sinking a winze. The lead shows 5 feet of quartz at a depth of 22 feet.

The Mountain Goat is sinking in the upper tunnel to connect with the raise in the lower tunnel for air.

The Eureka is expected to start up next week.

Mazama, May 31.

STEVENS COUNTY.

On Greenway mountain, near Valley, development work is progressing in the iron mines owned by Great Northern interests. It is said the railway will be built to the property and machinery put in for the permanent operation of the mine. The crosscut has been run 35 feet through ore, running 40% iron, with no undesirable elements. A working shaft will be sunk higher up the mountain than the present site. The company's main offices at St. Paul, Minn.—The Iron Hill mine adjoins the United States Marble Co., which will also be benefited by the building of a railway. The marble company is hauling blocks of its green marble 8 feet long to the station at Valley for shipment to New York.

The King G. & C. M. Co. is operating the Edna mine at the foot of Greenway mountain.

WYOMING.

CARBON COUNTY.

The owners of the Gibraltar mines at Grand Encampment are putting in a steam pumping plant, as the flow of water has been increasing. They have an 18-inch shoot of covellite.

FOREIGN.

AUSTRALIA.

WEST AUSTRALIA.

The electric slimes treatment plant at Southern Cross is in operation. Once the slimes reach the vortex mixer no manual labor is required, everything being done by electric motors, says the Sydney Mining Standard. The mixer is driven by a 10 H. P. motor. Weak cyanide solution

is used in breaking up slimes, which are pumped into elevated launders by three-throw pump 9 inches by 18 inches stroke, and driven by 7½ H. P. motor; launders convey liquid slimes into five 80-ton vats. Agitators driven by electricity are used to prevent settlement, driven by 20 H. P. motor. After six hours' treatment slimes are pumped by two horse power motors into launders and conveyed into two 45-ton spitzkasten. After slimes have settled somewhat, overflow from the spitzkasten is pumped into large feeding tank by 2 H. P. motor, then solution passes through two clarifying presses, then through precipitating boxes, and returns to vortex mixer to be again used. The heavier residues that have settled in spitzkasten (inverted pyramids) are discharged from bottom, and pumped into two washing cones, where they are thoroughly washed in a weak cyanide solution, then they are discharged into a slimes paddock, drainage from which is conducted to vortex mixer. The gold-bearing solution passes through precipitating boxes containing lead-coated zinc shavings.

BRITISH COLUMBIA.

Mining developments on Texada Island are reported progressing. Work on the tramway from the Cornell mine to salt water is going ahead. The Marble Bay mine is shipping ore to the smelter. Eastern men have a lien and bond on the Garland mine and have men at work sinking. The Puget Sound Iron Co. are running open cuts on various places on its copper deposits. H. McClusky has bought the Portia and Francis claims. The Francis is stated to show free gold.

Superintendent J. M. Long of the Yreka C. Co.'s mines at Quatsino says as soon as the additional machinery has been set up, about June 10, shipments of 3000 tons per week are expected to be made. The June group of claims on the east side of the southeast arm of Quatsino sound will be opened out and connected with salt water by a tramway ½ mile long.

A wire tram 3 miles long is being put up for the Silver Cup mine in the Lardeau district to connect the mine with the 125-ton concentrator. D. C. Forbes is manager of the Silver Cup and Nettie L. mines, both near Lardeau.

A number of Fort Steele men have located coal lands on Fording river, near Fort Steele, on unreserved crown lands. It is reported coal has been found on several tributary creeks and on Fording river. Last year the Trail smelter company located a block of forty-two claims, and have received a license from the Government to prospect the land for coal.

Shipments from Rossland camp for week ending May 30 and for the year to date are as follows:

	Week.	Year.
Le Roi.....	1,920	75,334
Center Star.....	1,320	34,618
War Eagle.....	1,020	23,445
Le Roi No. 2.....	360	11,117
White Bear.....		277
Velvet.....	100	2,626
O. K.....		25
Giant.....		335
Kootenay.....	350	1,295
Homestake.....		90

Totals.....5,070 149,152

At Le Roi No. 2 at Rossland the work consists of stoping on the second, fifth, third and fourth levels, development on the 700-foot level and diamond drilling on the 900-foot level. Building operations are being carried ahead on the concentrator plant.

The work of enlarging the Granby smelter at Grand Forks is progressing. The foundations of the two additional furnaces have been completed. Portions of the plant, including electrical equipment, are on the ground. The extension to the blower room has been completed and work started to build the extension to the flue dust chamber. Six furnaces, with a daily capacity of 2100 tons, will be in operation by July 15.

The London office has issued the following report on the operations of Le Roi No. 2, Ltd., at Rossland, for the month ended March 31: Output—Shipments for the month, 2506 dry tons; value per ton, less smelting charges, \$14.69; total value, less smelting charges, \$36,841; less copper adjustment, \$23; total, \$36,812, from which mining charges have to be deducted.

J. A. Turner, W. Walsh and M. Scully of Nelson have bonded the Queen gold mine near Erie for \$50,000, and operations will begin this month.

Manager Warner has men at work on the Wonderful mine, near Slocan.

Managing Director Colloff of the Arlington and Speculator mines, near Slocan, says on the Speculator the tunnel has opened up a body of ore 6 feet wide. There are 5 inches of rich ore on either side of a 5-foot ledge of concentrating grade. These streaks carry native silver and sulphides. The tunnel is in 3000 feet,

having cut through the Speculator and Speculator fractional claims and is now into the Mineral Mountain claim. On the Arlington a body of sulphide ore 1 foot in width was tapped in a tunnel 2600 feet from mouth of drift and at 370 feet depth.

At the Wild Horse Creek placers, near Fort Steele, the Ban Quon Co. have 1500 inches of water supplying two 6-inch giants.—Reports from Perry Creek placers, near Fort Steele, say the steam dredge began operations last week.

Construction work is under way for the compressor and hoisting plant for the Spitzee mine, near Rossland. A five-drill compressor will be set up, and the hoist will have a capacity for 500 feet. The intention is to sink to the 200-foot level this summer and continue mining on the 100-foot level.

H. F. Almy, manager of the Argenta mines, reports he has succeeded in interesting the Provincial Government in building a trunk road from Kootenay lake up Hammil creek, across the Furcell range of mountains, to Windermere. The first section of 3 miles has been started. This will give an outlet for a large quantity of ore awaiting transportation at the Lavina group, on Hammil creek. The Argenta mines propose putting in an aerial tramway to connect with the road, and a concentrator will be built on the creek.

CANADA.

ALBERTA.

The Canadian-American Coal Co. has sustained a loss of \$200,000 through the destruction of its entire mechanical plant at the Frank coal mines, and this will be increased by the loss of business for ninety days that will intervene before production can resume. Outside of this the damage amounts, in a way, to a benefit, for they will open the property in three places instead of one, and the equipment will be on a larger scale, says E. C. Spriggs of Butte, Mont., a director of the Canadian-American Coal & Coke Co. When the disaster occurred 1000 tons of coal daily were being produced, and this will be increased to 3000 tons. They will have two vertical openings to the mine in addition to the main adit tunnel from which all the coal mined to date has been extracted, reports the Rossland Miner. The openings will not be closer than a mile from each other. The seam on which they are working is 14 feet in width and vertical. The main tunnel is in 9000 feet.

MEXICO.

CHIHUAHUA.

J. C. Brooks and W. W. Bryan, of Chihuahua, have a lease and bond on the V. Primrose mine, near Parral.

Manager Sullivan, of the Chihuahua M. Co., at Santa Eulalia, has an option on the Duran mine at Almolaya, near El Valle, in Parral district. Development work has begun. The ore carries silver, lead and some gold.

L. Sanders, of Sonora, superintendent of the Santo Domingo placers, 80 miles east of Chihuahua, says operations have begun.

The San Juan mine at Santa Eulalia, belonging to the Pedro Prieto estate, has closed down.

H. Gamble, manager of the Parral M. & M. Co., says his company, composed of Toledo, Ohio, men, is developing the Cuatro de Julio mine, adjoining the Dos Republicas mine, near Parral.

A. P. Griffiths, late manager of the Palmarero mines, near Chihuahua, says the conversion of the 50-stamp mill from dry to wet crushing and the erection of the 400-ton cyanide plant have given satisfactory results. The ore, which is mostly sulphide with some gold, and averaging \$18 per ton, is crushed wet, concentrated and the tailings cyanided. The results obtained by the latter process show a total saving of 75% of the values. The total working costs have been brought down from \$23 to \$10.25 per ton, which includes the fact that ore has to be brought down by railroad 12½ miles. A 3½-mile aerial tramway to connect one of the mines with the railroad and a slimes plant are proposed. T. H. Oxnam is manager.

F. H. Husted, manager of the Terrenates Con. M. Co., of Parral, has applied for a concession to build a broad-gauge railroad from Minas Nuevas, in Parral district, a distance of 2½ miles to the mines of the company. The road is to have a third rail, so that cars of both the Parral and Durango roads (the latter being narrow gauge) can be used.

COAHUILA.

C. C. Pierce, of Laredo, Tex., reports the companies of which he is manager has 100 men at work developing some mines near Montemorelos.

DURANGO.

At San Juan de Guadalupe, La Azultla mine is being worked at depth of 350 feet, said to be the deepest in the camp.—El

Refugio mine in same district is being operated by J. J. MacTeague.

Work has begun at San Pedro del Gallo to open up the coal beds found there.

JALISCO.

W. A. Otis & Co., of Colorado Springs, Colo., have bought a group of mining claims at Mascota. One shoot has been uncovered for 120 feet and is 5 feet in width, containing 3½ feet of milling ore of good grade. The new owners are preparing to put in a plant of machinery. P. Fitzgerald, formerly of Cripple Creek, Colo., is manager.

SONORA.

The Cerro Escarlata G. M. Co. began operations last week, says the Bisbee, Ariz., Review. The group is 4 miles east of Nacoziari. They are sinking two shafts, each on a separate vein. There are twenty-six pertenencias in the group. R. O. Dillon is superintendent.

The Grand Central mine at Minas Prietas is being operated by C. A. Butters under lease.

One reason given for the closing down of the San Marcial coal mines at San Marcial is that the coal carries too much slate, thus injuring the commercial value of the product. The coal mines at Barrancas, however, owned principally by the Southern Pacific, are making a steady output.

J. Herman of Bisbee, Ariz., manager of the Alascia M. Co., near Cananea, says the company propose to erect a smelter this season.

Near La Concentracin, at the Prieto mine, La Dura M. Co. have connected their new shaft with the south workings by a drift 600 feet long at depth of 700 feet. On the 1000-foot level they are running a drift to the north workings, a distance of 1000 feet. At La Dura, 2 miles down the river from La Concentracin, the same company are operating La Gloria mine, which is also in ore.

J. P. Casey et al., of the Cananea Con. Co. Co., have the San Antonio mine of Cananea. A contract has been let for 500 feet of work, 200 feet sinking and 300 feet drifting. The main vein on which work is begun is 4 feet wide, and assays show copper 13%, silver 56 ounces and gold \$3 per ton.

Tayopa M. Co. of Los Angeles, Cal., are reported to have bought the Santa Rosalia, Cuba Libre, and Fierro Grande mines in Sierra Madre district. They are said to show values in gold, silver and lead. The Tayopa Co. will build a reduction plant.

Catalogues Received.

The Sullivan Machinery Co., of 135 Adams St., Chicago, Ill., have issued an attractive little pamphlet, descriptive of their hoists, air compressors, etc., and also of a hand operated diamond drill for prospecting purposes, as well as diamond power drills.

The American Spiral Pipe Works has issued a small catalogue descriptive of their spiral riveted pipe. The book is handsomely illustrated and shows the manifold uses to which this class of pipe may be put. It also contains valuable tables useful to those interested in hydraulics.

The A. Leschen & Sons Rope Co., of St. Louis, Mo., and San Francisco, Cal., have issued a new catalogue, No. 24, descriptive of wire ropes for all purposes for which ropes of this description are used. It also contains valuable information in the form of tables, and descriptions of Leschen's wire rope ways.

"Concentration Mills and Machinery" is the title of a handsome catalogue, No. 7 C, of the Colorado Iron Works Co. of Denver, Colo. It devotes several pages to a general description of the character and treatment of ores which may be concentrated to economical advantage, and also describes in detail the several mechanical appliances and machines by means of which concentration is accomplished. It is handsomely printed, finely illustrated and contains 95 pages of valuable information on the subject of concentration.

Obituary.

W. R. BOYKER, a pioneer miner of Placer county, Cal., died at his home near Kent, Wash., May 28, at the age of 75 years. Deceased was born in Charlotte-town, Prince Edward Island, and came West, across the Isthmus of Panama, in 1849. A widow, five daughters and seven sons survive him.

PERSONAL.

A. B. BROWNE, of Sumpter, Or., has gone to New York on mining business.

W. P. HAMMON of Oroville, Cal., is in San Francisco, Cal., on mining business.

DE W. CLARY of Stockton, Cal., is in San Francisco, Cal., on mining business.

F. H. HARVEY of Galt, Cal., has been making mine examinations near Carters, Cal.

JOHN R. TREGLOAN, mine owner of Amador City, Cal., is in San Francisco, Cal.

T. H. OXNAM is manager of the Palmarajo mines near Chinipas, Chihuahua, Mexico.

H. W. FAIRBANKS is on a geological expedition to the northern counties of California.

J. M. DYER of San Francisco, Cal., has gone to Grizzly Flat, El Dorado Co., Cal., to put up a mill.

F. FLETCHER of Trinity Center, Cal., interested in Trinity county mines, is in San Francisco, Cal.

A. H. LAZARE, manager Engineering Magazine of New York and London, is in San Francisco, Cal.

J. H. MACKENZIE of San Francisco, Cal., is at Angels, Calaveras county, Cal., on mining business.

G. MCM. ROSS, a mining superintendent of Virginia City, Nev., is in San Francisco, Cal., on business.

A. B. PAUL has returned to San Francisco, Cal., from an examination of mines in Siskiyou county, Cal.

JOHN LAWLER, owner of the Hillside mine, Yavapai county, Ariz., is in San Francisco, Cal., on business.

W. J. NELSON, who has mining interests at San Andreas, Calaveras county, Cal., is in San Francisco, Cal.

H. W. TURNER, superintendent Cherry Hill mine, near Yreka, Siskiyou county, Cal., is in San Francisco, Cal.

C. J. GARVIN of Cripple Creek, Colo., is manager of the Neglected mine, near La Plata, La Plata county, Colo.

W. L. WATTS, E. M., has returned to San Francisco, Cal., from an examination of mines in Mariposa county, Cal.

E. A. WILTSIE, of San Francisco, Cal., representing the Venture Corporation of London, has gone to Denver, Colo.

W. L. CABLE has returned to San Francisco, Cal., from examining mining properties in Siskiyou county, Cal.

C. S. OSBORN is superintendent of the Shasta May Blossom mine, in Bully Hill district, near Winthrop, Shasta county, Cal.

P. FITZGERALD is manager of a group of mines at Mascota, Jalisco, Mexico, for W. A. Otis & Co. of Colorado Springs, Colo.

F. A. GOURLEY of Nevada City, Cal., has gone to Alaska to open up a group of claims near Gollivan hay for a French company.

C. L. LANG has resigned as superintendent of the Cherokee group of mines near Carters, Cal., and has returned to Sonora, Cal.

W. SHARWOOD, owner of the Soulshy mine at Soulshyville, Tuolumne county, Cal., has returned to the mine from San Francisco, Cal.

L. SANDERS of Sonora, Mexico, is superintendent of the Santo Domingo placers, 80 miles east of Chihuahua, Chihuahua, Mexico.

N. COCHRANE, E. M., returned to Rossland, B. C., last week from a two months' visit in Scotland.

J. E. BACON of Tombstone, Ariz., interested in mines in Dos Cabezas district, returned to Tombstone last week from a trip to New York.

A. W. NELSON of San Francisco, Cal., is superintendent of the Alpine M. Co., Cable Cove district, near Sumpter, Or., vice R. Addom, resigned.

J. M. LONG, for a number of years superintendent of the Le Roi mine at Rossland, B. C., is superintendent of the Yreka C. Co. at Quatsino, B. C.

W. H. KERR, former manager of the Grant Oil Co., is superintendent of the Mount Hamilton Land & Oil Co., operating at Alcaide, Fresno county, Cal.

J. B. TREGLOAN of Amador City, Cal., has been appointed on the staff of California State Mineralogist L. E. Aubury, to do geological work in Amador county.

S. A. PARNALL, former manager of the S. A. Burrage mining interests at Terrazas, Chihuahua, Mexico, is superintendent of the Higgins Development Co. at Bisbee, Ariz.

H. G. OLIVER, superintendent of the electrical department of the War Eagle and Center Star mines, returned last week to Rossland, B. C., from a three weeks' trip to Winnipeg.

A. P. GRIFFITHS, former manager of the Palmarajo mines at Chinipas, Chihuahua, Mexico, is in London, England, and will go to China to examine mines for a South African company.

RICHARD A. PARKER, E. M., who has been at Hot Springs, N. M., for some months past for his health, has gone to Boston Highlands, Mass., for a few weeks. Later he will visit Denver, Colo.

H. W. GENDER has resigned as superintendent Metropolitan G. & S. M. Co., Ltd., of Ferguson, B. C., and taken position of manager for an Eastern company operating at Okanogan Landing, B. C.

W. H. KRITZER, E. E. for several months with Joshua Hendy Machine Works, San Francisco, Cal., has resigned, and will connect himself with the Risdon Iron Works Co., San Francisco, Cal.

G. K. FISCHER, formerly superintendent of construction of the Highland Boy and United States mining smelters, is engineer for the Newhouse M. & S. Co. of Utah, incorporated to operate the Cactus copper mines near Frisco, Utah.

J. D. SPARGO, formerly with the De Lamar Co., and until recently general superintendent of the De Lamar Gold Mountain mine in San Bernardino county, Cal., has gone from Los Angeles to Inyo county, Cal., to examine mining property.

Commercial Paragraphs.

THE Sullivan Machinery Co. of Chicago, Ill., have opened up an office in Rooms 1209-10 Missouri Trust Bldg., St. Louis, Mo., where P. F. Jarvis will have the management of the company's business.

THE Salida Gold & Copper M. Co. has placed a \$3000 order with C. Wallace of Denver, Colo., for pulverizing machinery for the new copper leaching plant, on the Sedalla property, near Salida, Co. In the order are six 24-inch Wallace sectional steel crushers. The ore passes a rock breaker before going to the pulverizers. It is claimed that the "wear and tear" of these machines will not exceed 1 cent per ton of ore treated.

PAWLING & HARNISCHFEGGER, crane and hoist builders, Milwaukee, Wis., advise that their hooking of orders is satisfactory. The many modern shops planned by railroads have resulted in a large volume of estimates for crane equipment; many of these contracts will be closed, they say, within thirty days. The steel and iron plants continue the heaviest buyers, though the demand for cranes is broadening. The old Nordberg shops, leased and equipped by Pawling & Harnischfeger to replace their erecting shops burned April 15, have placed them in as good shape to build cranes as prevailed before the fire. Among orders hooked recently are the following: American Stone Co., Brooklyn, N. Y., two cranes; Milwaukee Bridge Co., Milwaukee, Wis.; Louisville Railway Co., Louisville, Ky.; Louisiana Purchase Exposition, St. Louis, Mo.; Ingersoll-Sergeant Drill Co., Easton, Pa.; two cranes; Milton Mfg. Co., Milton, Pa.; Vilter Mfg. Co., Milwaukee, Wis.; American Road Machine Co., Kennett Square, Pa.; Stillwell-Bierce & Smith-Vaile Co., Dayton, O., two cranes; Mahoning Foundry & Machine Co., Youngstown, O.; New York Shipbuilding Co., Camden, N. J.; McConway & Torley Co., Pittsburgh, Pa.; Sterritt-Thomas Foundry Co., Pittsburgh, Pa.; Standard Oil Co. of New York, Atlas Works, Buffalo, N. Y.; Pennsylvania Engineering Works, New Castle, Pa.; Metropolitan Street Railway Co., Kansas City, Mo., two cranes; Jefferson & Clearfield Coal & Iron Co., Ernest, Pa.; International Harvester Co., Hamilton, Ont.; Gould Coupler Co., Depew, N. Y., three cranes; Helena Light & Traction Co., Helena, Mont.; American Sheet Steel Co., Pittsburgh, Pa., two cranes (one special); Allis-Chalmers Co., Milwaukee, Wis., two cranes; Howard Iron Works, Buffalo, N. Y.; American Bridge Co., Ambridge Works, Economy, Pa.; La Belle Iron Works, Steubenville, O.; Bradley Mfg. Co., Pittsburgh, Pa.; New York Edison Co., New York.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING MAY 26, 1903.

- 728,840.—STEAM BOILER—W. N. Best, Los Angeles, Cal.
729,261.—SOLDERING MACHINE—Black & Smith, S. F.
729,123.—ENVELOP—F. S. Boedefeld, S. F.
729,037.—CAR COUPLING—Bowen, Neunham & Barnett, Los Angeles, Cal.
729,138.—ATOMIZER HOLDER—J. C. Cramer, Sawtelle, Cal.
729,317.—ELECTRICAL TREATMENT—H. Fleetwood, Los Angeles, Cal.
729,333.—WOOL WASHER—Haas & Baruch, S. F.
729,162.—BOTTLE—W. B. Hargan, S. F.
728,912.—STREET LAMP—H. M. Hastings, Geyerville, Cal.
729,169.—STAMP STEM GUIDE—J. H. Hendy, S. F.
729,183.—BALING PRESS—J. Jensen, Livermore, Cal.
729,076.—FILING CASE—J. Lee, S. F.
729,215.—OIL BURNER—J. H. Morrissey, S. F.
729,392.—BINDING DEVICE—A. Newell, Pasadena, Cal.
729,025.—BOBBIN—F. J. Rabbeth, Redlands, Cal.
729,096.—FLIER—F. J. Rabbeth, Redlands, Cal.
729,232.—HEATING PAD—W. Rickards, Los Angeles, Cal.
729,475.—BOTTLE—P. J. Wilson, Ben Lomond, Cal.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

HYDROCARBON BURNER.—No. 729,205. May 26, 1903. J. H. Morrissey, San Francisco, Cal. This invention relates to improvements in oil burners for furnaces and the like. Its object is to provide a double jet device of simple construction, one by which the flame can be directed according to the area or nature of the surface to be heated and employing a minimum air pressure to effect volatilization of the oil.

BATTERY STAMP STEM GUIDE.—No. 729,169. May 26, 1903. J. H. Hendy, San Francisco, Cal. This invention relates to a guide for the stems of battery stamps. It consists in the formation of a chamber within the guide, a piece of thick felt fitting in said chamber and having a segmental compressing spring plate fitting around its exterior and an independent spring pressing upon the back thereof, whereby the felt is held in close contact with the stamp stem and its movements.

BALING PRESS.—No. 729,183. May 26, 1903. J. Jensen, Livermore, Cal. The object of this invention is to provide a hay press of simple construction and of largely increased capacity over presses of the ordinary type. It consists in a haling press, the combination of a horizontal press box, a lower movable therein, worm shafte exterior to the box, projections on said follower engaging said shafts, said means including a drum, oppositely wound ropes or cables secured to said drum and connections between said drum and shafts whereby the latter are revolved in unison. There are other details of construction which provide an easily operated machine.

ENVELOPS.—No. 729,123. May 26, 1903. F. S. Boedefeld, San Francisco, Cal. This invention consists of a body portion of the desired shape having flaps extending from each of the four sides, these flaps having transverse foldable extensions at the ends, the extensions of the flaps being adapted to overlap and coincide when said flaps are folded in. The flap formed upon one of the longer sides has a slot made transversely in it, and the other flap has transverse extensions upon the end foldable upon each other, so as to allow this end to be inserted through the slot, and when thus inserted the transverse extensions form a lock to prevent its being withdrawn. In conjunction with this construction an adhesive cement serves to unite the flaps when folded up, so as to make it impossible to open the envelop without destroying it.

Books Received.

"Granites and Gneisses of Georgia" is the title of Bulletin No. 9 A of the State Geological Survey of Georgia, by Thos. L. Watson, assistant geologist, W. S. Yeates, State Geologist. The volume is profusely illustrated, showing the geological features of the granitic area, and gives much information of a practical kind in reference to the extensive granite quarries of that State.

"Ventilation in Mines," by Robert Wabner, translated from the German by Chas. Salter, is the latest work on practical mining issued from the scientific press. It is a monograph on an important subject, and one which is too frequently neglected by practical miners, particularly in the metal mines. The volume deals with composition of the air in mines; means of preventing the danger from contamination of mine air; means of ventilation; natural ventilation, mechanical ventilation, ventilating fans, etc. The book cannot fail to be of interest to every mine superintendent. Price, \$4.50, net. It contains numerous illustrations; 240 pages; Scott, Greenwood & Co., 19 Ludgate Hill, London, England; D. Van Nostrand Co., New York City.

Latest Market Reports.

SAN FRANCISCO, June 5, 1903.

METALS.

SILVER.—Per oz., Troy: London, 24½d (standard ounce, 925 fine); New York, bar silver, 53½c, refined (1000 fine); San Francisco, 53½c; Mexican dollars, 42¢ @ 42½c San Francisco, 42½c New York.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50@14.75; Electrolytic, 1 to 3 casks, \$14.50@14.75; Casting, 1 to 3 casks, \$14.50@14.75; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18¢@24c. London: £60 spot per ton.

An Eastern merchant and a close observer of the metal market is quoted as saying:

"I think producers will have no difficulty in maintaining 15 cents as the minimum price for the metal for the balance of the year, and this view is based upon the belief of some of the best judges of the metal in the world. That which has been attempted and successfully in iron and steel is coming to a focus in copper. Two of the heaviest copper interests in the world—the Standard oil people and the Rothschilds—have for some time past been working along common lines, and so far as the present selling price of the metal is concerned, practically all interests are satisfied with 15 cents, lake and electrolytic basis. I believe that between July 1 and January 1 next the consumption of copper will not fall below 50,000,000 pounds per month. I estimate the consumption of the world for 1903 at 620,000 tons, and the production will probably not exceed 600,000 tons. I place the visible supply Jan. 1, 1903, at 67,000 tons."

LEAD.—New York, \$4 37½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots, 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £11 8s 9d per long ton—2.75c per lb.

SPELTER.—New York, \$5.75; St. Louis, \$4.60; London, £20 17s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13¢@15c.

TIN.—New York, pig, \$28.50@28.75; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32c; bar tin, \$3 35c @37½c. London, £129 spot.

PLATINUM.—San Francisco, crude, \$18.00 ½ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75¢@80c per gram.

QUICKSILVER.—New York, \$44.50@46.00; large lots; London, £3 15s; San Francisco, local, \$45.00 ½ flask of 76½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.75c.

NICKEL.—New York, 50¢@60c ½ lb.; ton lots, 45¢@48c.

GENERAL SUPPLIES.

IRON.—Pittsburg, Bessemer pig, \$19.75 @20.25; gray forge, \$19.85; San Francisco, bar, 3c ½ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$31.50; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

POWDER.—F. O. h. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

OILS.—Linseed, hotted, bbl., 54c; cs., 59c; raw, bbl., 54c; cs., 59c; Lucol oil, hotted, bbl., 50c; cs., 55c; raw, bbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 21c; Astral, 21c; Star, 21c; Extra Star, 25c; Eocene, 24c; Elaine, 27c; Water White, in bulk, 14½c; Mineral Seal, iron bbls., 13½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot oil, pure, bbl., 75c; cs., 80c; Sperm, crude,

50@60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs, 50@55c.

CANDLES.—Granite 6s, 16 oz., 40s., 10½¢ per set; 14 oz., 40s., 9½¢.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½¢; in 25-lb. tin pails, ¾¢ per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ¾¢ per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6½¢.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 25@26¢ per lb.; carloads, 23@24½¢; in tins, 35¢; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 2½@2½¢ per lb.; caustic soda, in drums, 3@4¢ per lb.; Cal. s. soda, bbls., \$1.25 @ 1.50 per 100 lbs.; sds., \$1.05; chlorate of potash, 12@13¢; nitrate of potash, bbls., 10¢; caustic potash, 10¢ in 40-lb. tins; borax concentrated, 7@8¢ per lb.; roll sulphur, 4@6¢; powdered sulphur, 2@3¢; flour sulphur, French, 2@3¢; alum, \$2.00 @ 2.25; California refined, 2@2½¢; sulphide of iron, 9¢ per lb.; copper sulphate, 5@7¢; chloride of lime, spot, \$2.50 @ 2.75; sulphuric acid, in carboys, 66% B, 2½¢ per lb.; nitric acid, in carboys, 8¢ per lb.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallend, \$6.50 Brymbo, \$7.50; Pennsylvania, hd., \$14.00 Scotch, \$8; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½¢.

LITHARGE.—Pure, in 25-lb. bags, 8 @ 9¢ per lb.

BONE ASH.—Extra No. 1, 5@6¢ per lb. No. 1, 4@5¢.

BORAX.—Concentrated, 7@9¢ per lb powdered, 9@12¢; fused, 25@30¢.

BORAX.—Crystal, 7c; calcined, 25c.

MANGANES.—Pure, ½ lb., 60c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

BISMUTH.—Subnitrate, per lb., \$1.60.

SODIUM.—Metal, ½ lb., \$1.00.

MERCURY.—Bichloride, ½ lb., 90c.

PHOSPHORUS.—(American) ½ lb., 75c.

SILVER.—Chloride, ½ oz., 90c @ \$1.00; nitrate, 55c.

ALUMINUM.—No. 1, 99%, small lots, 37¢ per lb.; 100 lbs., 35¢; 1000 lbs., 34¢; ton lots and over, 33¢, Pittsburg. No. 2, 90%, small lots, 34¢; ton lots and over, 31¢, Pittsburg.

URANIUM.—Oxide, ½ lb., \$3.50.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., .04c.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

SITUATIONS WANTED.

A MINE SURVEYOR, AN ASSAYER AND Analytical Chemist, with a thorough acquaintance with the cyanide process and a graduate of a leading mining college, is open to engagement. The best of references furnished. Address Box 558, Los Angeles, Cal.

A YOUNG MAN WITH 12 YEARS' PRACTICAL mining experience wants position where the ability to do things and doing them will lead to advancement. Can assay, survey, run engine or pumps, sharpen tools, or do anything about a mine. Have some mill experience. References given. Address R. J. S., care of this office.

CYANIDE CHEMIST OR MILL SUPT. TECHNICAL graduate. Specialty, construction; also, successful treatment of low grade ore and slimes. Good references. Address "Spanish," this office.

EXPERIENCED ASSAYER, ANALYST AND Draughtsman desires position with mine, mill or smelter. Excellent references. Speaks Spanish. Address "Metallurgist," this office.

FIRST-CLASS METALLURGICAL CHEMIST and Assayer desires position. Can furnish best of reference, etc. Address C. W. L., this office.

FIRST-CLASS MINING AND LAND SURVEYOR, Draughtsman, etc., desires position. Address H. W. K., Box 74, Long Beach, Wash.

MILLMAN DESIRES POSITION WITH GOLD mining company to erect or take charge of stamp mill. Extensive experience gained in the treatment of ores in United States, Central and South America. Can assay and test ores to determine best method of treatment. Excellent references. Address "Aurum," care of this office.

WANTED.

WANTED--MILL TAILINGS, Gold, silver or lead, in New Mexico, Arizona or Old Mexico. Will buy or lease. Give location, quantity and value. A. E. VAN VELSAN, Telluride, Colorado. Box 181.

Wanted---A Superintendent

For foundry, forge, machine and boiler shops employing 200 men. Should be posted on mining machinery, structural work and up-to-date methods. Permanent position in excellent location. State qualifications and experience fully and salary expected. Answers confidential. Address Z. P. O. box 153, Station C, Los Angeles, Cal.

MINING STOCKS WANTED.

If you are a stockholder in any good going mining company and want to sell your shares

WE CAN GET YOU CASH.

Send for our price list of 500 stocks. It tells what we will buy and what we will sell.

CATLIN & POWELL, 94, 35 WALL ST. NEW YORK.

DELINQUENT SALE NOTICE.

GOLDEN CHANNEL DRIFT MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Butte County, California.

Notice.—There are delinquent upon the following described stock, on account of assessment (No. 3) levied on the 11th day of April, 1903, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Am't.
A. B. Paul, Trustee	13	25	37½¢
A. B. Paul, Trustee	18	2,000	30 00
A. B. Paul, Trustee	22	500	7 50
A. B. Paul, Trustee	24	1,000	15 00
A. B. Paul, Trustee	25	1,000	15 00
A. B. Paul, Trustee	52	5,000	75 00
A. B. Paul, Trustee	55	200	3 00
A. B. Paul, Trustee	57	1,487	21 55½¢

And in accordance with law, and an order from the Board of Directors, made on the 11th day of April, 1903, so many shares of each parcel of such stock as may be necessary, will be sold at public auction, at the office of the company, Room 27 Crocker Building, San Francisco, California, on SATURDAY, the 20th day of June, 1903, at the hour of 3 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

GEO. W. FLEISSNER, Secretary.
Office—Room 27 Crocker Building, San Francisco, California.

ANNUAL MEETING.

The Regular Annual Meeting of the Stockholders of the National Cons. Mining Company will be held at the office of the company, 773 Mission St., San Francisco, California, on MONDAY, the 1st day of June, 1903, at the hour of 8 o'clock P. M. for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the meeting.

GEO. W. FLEISSNER, Secretary.
Office—773 Mission St., San Francisco, California.

MONEY LOANED MINES. Developed or partly developed which have Ore in sight. First-class references. Established 1855.
E. N. BREITUNG & CO.,
Marquette, Mich.

TO TOOL SHARPENERS

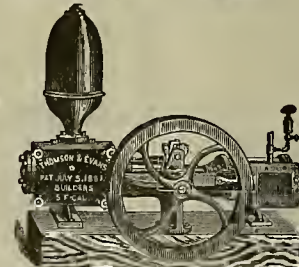
and **AMATEUR TOOL SHARPENERS!** I will send formula, with full instructions, by which you can temper machine or hand steel so that it will stand in any kind of rock and not chip, batter or break. Result of twenty years' practical experience in Rocky mountains. Price 50 cents. Satisfaction guaranteed or money refunded. C. H. Bennett, 50 Mill St., Aspen, Colo.

C. H. EVANS & CO.,

Machine Works.

Thomson & Evans
Steam Pumps.

DEEP WELL
and
POWER PUMPS.



MARINE ENGINES.

SHIP and STEAMBOAT WORK.

PIPE CUTTING, Etc.

183-185-187 Fremont St.
SAN FRANCISCO

Strictly C. P. Acids and Ammonia

For Laboratory Use and Fine Chemical Work. Also Commercial Acids.
MANUFACTURED BY
THE WESTERN CHEMICAL MFG. CO., Denver, Colo.

Gilt Edge Mining Investments.

DEVELOPED MINES AND PROSPECTS BOUGHT AND SOLD. We offer a few shares underwritten stock in a very good Gold Property. Report on mining properties, stock list, and further particulars to interested parties. Correspondence solicited.

THE MINES EXCHANGE LIMITED,
BOX C. 1006-112 CLARK ST. CHICAGO, ILL.

Calumet, Mich.; Duluth, Minn.; Salmon, Idaho; Nelson, B. C.; Camborne, B. C.; Cranbrook, B. C.

Wire Ropes.

Hoisting, Hauling, Power Transmission and other uses.

ELECTRICAL, TROLLEY, FEEDER, WIRES, IRON, STEEL, COPPER.

Strength, Durability and Flexibility GUARANTEED.

Steel Shafting. Copper Rail Bonds.

American Steel & Wire Co.

GEO. H. ISMON,

Pacific Coast Sales Agent. 16th and Folsom Sts.

SAN FRANCISCO, CAL.

PORTLAND. SEATTLE. DENVER. LOS ANGELES.

MACHINERY FOR SALE.

For Immediate Delivery.

Crushing Outfit.

8x16 Grotton jaw crusher mounted on wheels, complete with elevator, screen and elevator platform.
Ingersoll-Sergeant under-cutter.

Steam Pumps.

16x9x12 Snow Underwriters' fire pump.
18x12x10 Worthington standard duplex.
10 & 16x10x10 Worthington compound duplex.
8 & 12x10x10 Worthington compound duplex.
16x8x10 Worthington standard duplex.
7x8x6 Worthington.
14 & 20x6x18 Worthington compound.
6x5x5 Worthington.
6x4x6 Worthington.
4x3x4 Worthington.
5x3x5 Worthington.
3x2x3 Worthington.
4...H. T. Davidson No. 10 pumps with Fieher governor; suction 7 in.; discharge 6 in.
10x12x12 Dean duplex.
Sillsby rotary fire pump.
6x4x6 Knowles single acting.
8x6x10 Holly single.
7x4x7 Crane.
7x4x7 Canton duplex.
14x7x12 Dean single.
12x6x18 Norwalk.
8x5x10 Gaskell.
7x4x10 Smedley.
5x1x5 Blake duplex.
6x10x12 Warren-Webster vacuum.
10x20x18 single direct acting.
No. 2 Buffalo jet condenser complete with air pump and receiver up to 250 H. P.
50...Boiler feed pumps.

Centrifugal Pumps.

2...12 in. Morris submerged.
No. 4 Morris horizontal with friction pulley.
No. 12 belt driven Morris Machine Co.'s sand pump; 14 in. suction; 12 in. discharge.

Structural Iron.

We have all kinds. If interested, write for a copy of our STRUCTURAL NEWS.

Incandescent Lamps.

We bought 200,000 absolutely new, clean incandescent lamps, with T. H. and Edison bases. They range from 100 to 120 voltage and from 8 to 25 C. P. They are put up 250 in a barrel, just as they came from the factory. Price in barrel lots:
Edison base.....9 1/4 cts. each
T. H. base.....10 1/4 cts. each

Air Compressors.

12x12 Snyder-Hughes.
14x14x18 Ingersoll-Sergeant class "H" straight line.
18x18x30 Ingersoll-Sergeant class "H" straight line.

Pipe.

Standard black wrought iron pipe, second hand; sizes from 3/4 to 12-in. CASING of all sizes. We can save you money on pipe. Write us your wants.

Cable.

A stock of good second-hand cable from 3/4 to 2 1/4-in.

Rope.

We have come very good Manila rope; sizes from 1 to 2-in. in long lengths.

Dump Cars.

12...36 gauge "Western"
25...24 gauge "Western."

Rock Drills.

Ingersoll "A" Cylinder 1 1/2 in. diameter.
" " " " 2 1/2 " "
" " " " 3 " "
" " " " 3 1/2 " "
" " " " 3 3/4 " "
" " " " 4 " "
Complete with tripods and weights.
3 1/2 in. Rand "Little Giant."
2 in. Sullivan.
Bullock "Champion" diamond drill and complete outfit.
Standard hand power drill and complete outfit.
Sullivan "M" and complete outfit.

WRITE FOR CATALOGUE NO. 360.

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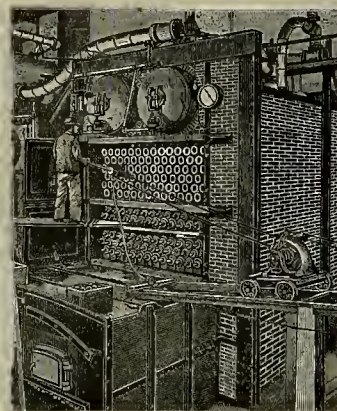
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Every Engineer and Steam User

WILL BE INTERESTED IN THIS LETTER ABOUT

WEINLAND TUBE CLEANERS

From a Practical Superintendent of a Modern Up-to-Date Plant.



OFFICE OF
PITTSBURGH PLATE GLASS CO.
ELWOOD, IND., Jan. 5, 1903.

The Lagonda Mfg. Co.
Springfield, Ohio.

Gentlemen: Your Weinland Mechanical Tube Cleaner, which you have installed in our Elwood plant, is giving entire satisfaction with the work it is doing.

We have removed approximately about 50 bu. of scale from one of the Babcock & Wilcox boilers of 125 tubes, 18 feet long.

Our scale would average in some places in the tubes from 1/4 to 3/4 inch thick.

This machine has removed that scale successfully, both in time and labor.

We have tried in our plant about all the devices that are on the market in the way of Mechanical Cleaners, and we find that this Weinland Cleaner will do from 50% to 75% more work, with the same per cent less of repairs, than anything we have ever had.

We accepted this machine after it had been given a thorough test and are satisfied with all its details.

Respectfully,
S. E. CLARK, Supt.
Pittsburgh Plate Glass Co.
Elwood, Ind.

Note! Condition of Scale. Most Cleaners "quit" in Time of Cleaning. "hard scale." These are vital points in Cost for Repairs. which the WEINLAND excels all others.

Here's Another Style.



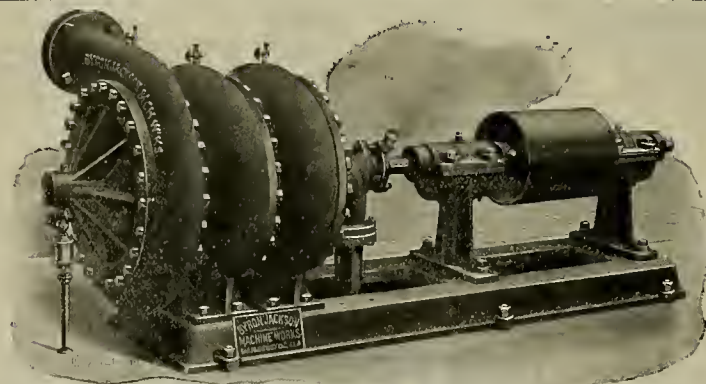
Our Improved No. 8 Water Power Cleaner. Extra Strong and Durable. Unequaled in this line. You'll like our hose coupling which we furnish with the cleaner—saves lots of bother and "cuss words," as hose can't pull out.

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SAN FRANCISCO, CAL., SATURDAY, JUNE 13, 1903.

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Mining in Western Australia.

Within recent years Western Australia has attracted much attention by reason of the large output of the mines in that region, which includes Coolgardie field, the most important. This portion of Australia is an elevated tableland, described as being about 1500 feet above the sea, but with only slightly modified topography. The entire region, comprising many hundred thousand square miles, is one once worn down to what geologists call a "base level of erosion." That is, this portion of Australia was at one time exposed to erosive influences for a very long period, during which all the elevations were reduced in altitude to nearly the level of the sea. When this had nearly been accomplished the region began to rise and continued to be uplifted until its present level was reached. This is briefly the condition as at present understood. Throughout this vast territory, nearly 1000 miles square, are scattered the various mining districts in which are found gold, silver, lead, antimony, copper, diamonds and other metallic and mineral products. The entire region is sterile and barren, but few trees growing there naturally. Water is very scarce, as the rainfall is light and uncertain.

In sinking mine shafts in this desert, the miners not infrequently found water, but almost without exception the water was unfit for domestic or other uses, containing generally a large percentage of sodium chloride (table salt). To utilize this water, which was all that could be obtained in the region, large condensing plants were built to distill the salt water from the mine shafts for domestic uses, and for steam making. One of the accompanying illustrations is that of a large condensing plant at the Lake View Consuls mine, Coolgardie. The mines became so productive, however, that the idea of pumping water to the gold fields was taken up, and although the nearest large, available supply of water was about 385 miles distant, yet the project was undertaken and carried out to successful completion. The pipe line was finished and the first water was pumped into Coolgardie district a few weeks since. A description of this great pumping plant was pub-

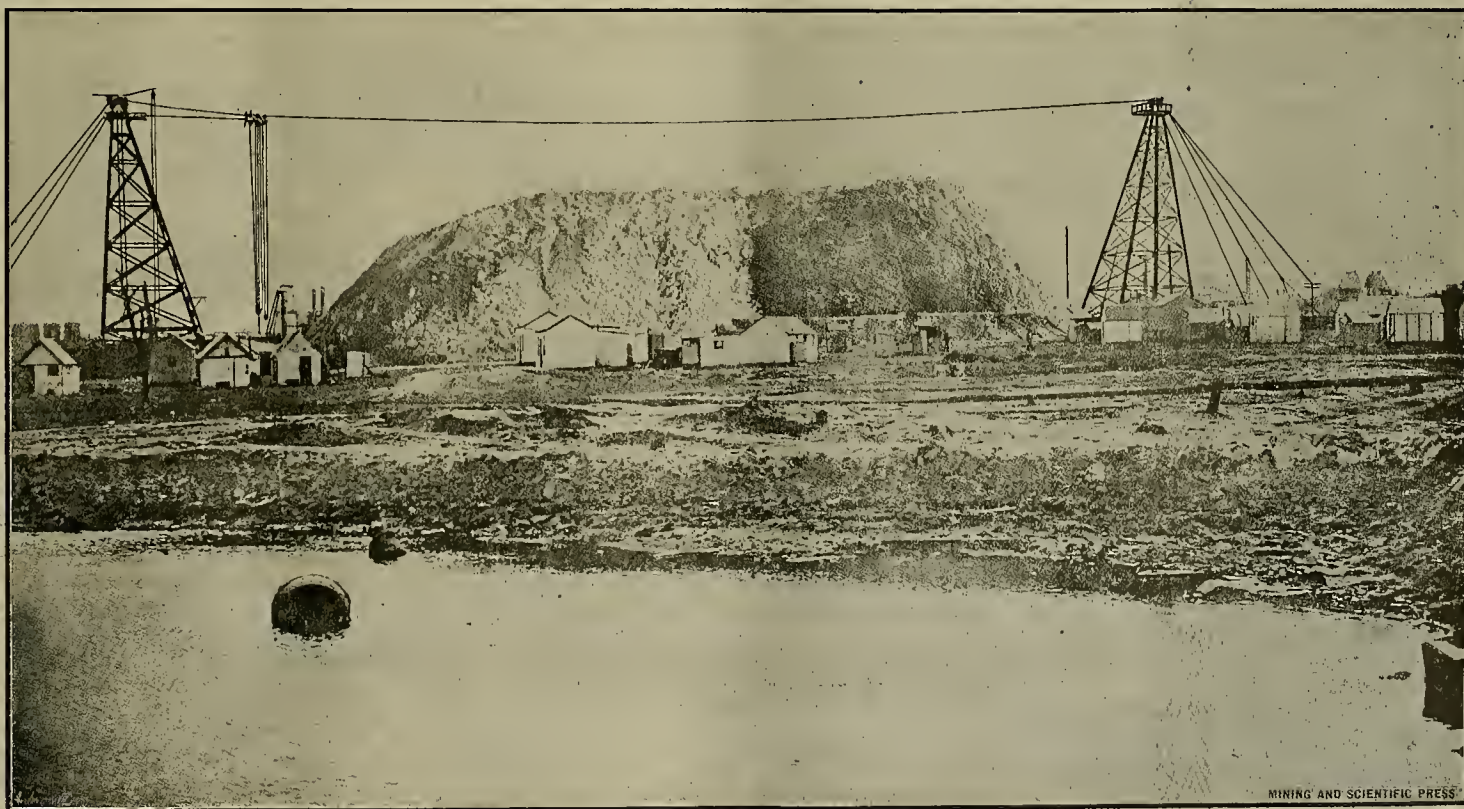


Condensers, Coolgardie, Western Australia.

lished in the MINING AND SCIENTIFIC PRESS of May 2, 1903. The main line is 387 miles in length, of steel pipe 24 feet in diameter. There are along the line twenty stations and sixty-five pumping engines. This great hydraulic system was designed and built to supply the mines with water, at a cost of nearly \$15,000,000. When the mines are worked out the pumping system will have outlived its usefulness. The present capacity of the system is 5,000,000 gallons daily, which is considerably more than the mines require at this time, but the Government has wisely anticipated this demand.

Owing to the level character of the district about

Coolgardie, dumping ground is difficult to obtain, and the problem of caring for large amounts of tailings has been ingeniously solved by the building of steel towers connected by ropeway. The tailings are hoisted in a bucket carried along the wire tram and dumped whenever desired, as shown in the accompanying picture. Both illustrations on this page are from the report of the Department of Mines for Western Australia for 1901, and their use made possible herein through the courtesy of H. S. King, under secretary of mines for Western Australia. At present the superfluous water will be employed in irrigation.



Method of Handling Tailings, Coolgardie, Western Australia.

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Condenses, Coolgardie, Western Australia.....	377
Method of Handling Tailings, Coolgardie, Western Australia.....	377
Head-Works Framing.....	380
The Card Concentrator.....	382
Sketch of Combined B'ower and Exhaust.....	383
A Triple Diesel Unit.....	384
Two Single Diesel Units.....	384
Mining and Metallurgical Patents.....	385
EDITORIAL:	
Mining in Western Australia.....	377
Co-operative Mining.....	378
Requisites of the Manager of a Mine.....	378
Record of Annual Labor Unnecessary.....	378
Additional Labor Troubles.....	378
The Iron Ore Supply.....	378
MINING SUMMARY	386-387-388-389-390
LATEST MARKET REPORTS	17
MISCELLANEOUS:	
Concentrates.....	379
Head-Works Framing.....	380
Iron Ore in North Carolina.....	380
Mining in Bendigo.....	381
The O'Meara-Lynch Mill, Tonopah, Nev.....	381
The Card Concentrator.....	382
Auriferous and a General Theory of Gold Ore Genesis.....	382
An Exhaust Fan and Blower.....	383
Gold Ores of Ontario, Canada.....	383
The Diesel Engine.....	384
Electric Furnaces for Very High Temperatures.....	384
Mining and Metallurgical Patents.....	385
Personal.....	390
Obituary.....	390
Commercial Paragraphs.....	390
New Patents.....	390
Notices of Recent Patents.....	390

Additional Labor Troubles.

A week ago the difficulties which had been anticipated between the mine operators and the Union miners in Arizona did not bear a very threatening aspect, but this week finds that Territory the center of interesting complications, and the outlook in the southeastern part of the Territory is not at present reassuring. About Clifton and Morenci, neighboring towns in Graham county, it is reported 3500 miners are out on strike, and their attitude is described as threatening, so much so that the Territorial militia have been ordered to these camps, and the peace officers are doing all in their power to prevent destruction of life or property. When the Territorial eight-hour law went into effect June 1 the management of the mines offered nine hours' pay for eight hours' work. This the miners refused, demanding the same wages as had been previously paid for ten hours. The strikers are said to be mostly Mexicans and Italians, of a class difficult to restrain when excited.

At Searchlight, Nev., trouble has occurred and all the mines were closed a few days since, owing to the miners striking at the Quartette mine. The Nevada Legislature also passed an eight-hour law at their last session, but the law was made to affect only underground men. When on the 1st of June the law went into effect, the Quartette Co. announced that it would require top men to work nine hours, as they were not included in the eight-hour law. Upon receiving notice to this effect, the Union called a strike and all men employed by the Quartette Co. quit, including railroad engineers and mill men, only pump men being allowed to remain to keep the mine clear of water until the strike is either settled one way or another. It is understood that only three men are affected by the determination of the company, but the other companies in the camp have also closed down, anticipating similar trouble. Arbitration has been suggested and it is not unlikely that a satisfactory agreement will be reached.

At Randsburg, Cal., the Miners' Union made a demand a week ago at the Yellow Aster mine for \$3.50 for miners and \$3 for muckers. This demand was refused by the management, who further stated that it would no longer recognize the Union. In consequence the miners struck. The Yellow Aster is the largest

and most extensively developed mine in the Randsburg district, and has a large stamp mill. The mine is perfectly dry, and little or no damage is likely to occur as a result of suspension of operations. In view of this fact it may be expected that an adjustment of the trouble in that district will not be speedily reached. The management claims that the company has been paying higher wages than in most other California districts, and will entertain no proposition to increase pay of either miners or muckers.

Record of Annual Labor Unnecessary.

The United States mining laws, while not perfect, are in the main just, clear and equitable; but State and local laws made to govern the conduct of mining business and to secure title to mining property are not always as comprehensible as may be desired; moreover, some of these laws are not wholly in accordance with congressional laws, and in some instances have a tendency to usurp prerogatives of Congress. Several States have passed laws requiring the recording within specified time, with the county recorder, an affidavit of annual assessment work, and this sworn statement of labor actually performed, or expenses made for the benefit of the claim, shall be prima facie evidence that the labor has been performed or the improvements made, as claimed. In no instance, however, is it clear that a forfeiture follows a failure to record the work performed or improvements made. The States having such laws are Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Washington, Wyoming, Arizona and Arkansas.

A law was passed by the California Legislature March 31, 1891, which required that proof of annual labor be recorded, but the law is not at all clear that failure to so record the labor shall work a forfeiture. The proof of the labor is a secondary consideration. The United States statutes require that \$100 worth of labor be performed annually, and this is the main thing, and where the labor has actually been performed, or improvements made as required by the statutes it is likely in most instances that proof could be easily made that the labor had been performed, which satisfied the requirements of the United States statutes. Moreover, it is extremely doubtful if the courts would sustain any State law making forfeiture the penalty for failure to record labor actually performed.

In Tuolumne county, Cal., several persons are reported to have recently jumped the Deadhorse mine, one of the old and noted mines of that section, for the reason that the owners, who several months ago closed the mine and removed a portion of the machinery, have failed to record labor performed in 1902. Under the United States law, the mine, which is unpatented, would not be subject to relocation until Jan. 1, 1904, and not then if the owners recommenced work on the property before that date and continued it until the necessary amount of work had been accomplished. There still remains on the property a 20 stamp mill, cyanide plant and several buildings. The mine has been extensively developed to a depth of 1700 feet.

THE manager of a mine should have a knowledge of the details of all operations, mechanical and otherwise, carried on under his direction, but it is neither essential nor expedient that the manager should undertake the actual manual labor which he employs others under him to perform. Knowledge of detail is important, but the performance of these details by the manager is not good business, any more than it is economy to have the \$4 or \$5 a day mechanic carrying lumber while the \$2 man looks complacently on, willing he should do it. The duties of the manager are eminently those of general planning and supervision, the details being left to the direction of his lieutenants—the heads of the various departments. The time of a mine manager is too valuable to be spent in pushing a car, mending a refractory machine, or shoveling sand to make concrete, and the wise and experienced manager will attempt neither of these, but he should know how many cars a man will tram a shift under existing conditions; how many tons of rock or ore a mucker should shovel in a shift; how many feet of ground should be drilled by hand or with machine in a stated time.

The Iron Ore Supply.

There has been some anxiety expressed as to the future supply of iron ore. That this question should be viewed with much concern for many years to come is not suggested by the present condition of the iron industry nor by the outlook for the future. There are great iron mines operated in various parts of the United States, the largest and most notable being those in the vicinity of Lake Superior, in Michigan, Wisconsin and Minnesota. There are still hundreds of millions of tons of first-class iron ore still available in that region, and it is not unlikely that other great deposits as yet unknown will be found. It is true those deposits most easily discoverable and worked have probably mostly been found, but in the great forests, and beneath the glacial drift which covers a large portion of that region, it is more than probable other deposits will be discovered which would add enormously to the iron output of the United States. Moreover, there are hundreds of millions of tons of the so-called "low-grade ore" in the mines now working which later will become available, though considered of little value at this time in comparison with the richer ores of those great mines. There are other large deposits in the Southern and Western States which in time will supply large amounts of fine ore. It is true that in this day many of these deposits have relatively small commercial value, or none at all, owing to the cost of mining, transportation and reduction of the ore to metal, but the advance of scientific knowledge and changing conditions may be trusted to equalize these differences. In other countries there are vast deposits of valuable iron ore. Mexico is said to have numerous large deposits, some of which are known to be of superior quality. South America may also become an important factor in the iron industry in time. In Central Africa, particularly in the Congo State, there are large deposits of fine iron ore. The natives for many years have utilized these deposits, smelting the ore in small primitive furnaces in the ground and employing the metal in the manufacture of weapons, ornaments, etc., at the production of which they are expert workmen.

Another factor in the production of the iron of the future is the probable substitution of some other metal for iron and steel. In seeking for the possible substitute, one looks naturally to aluminum, though at its present price it is used in structural work, to a very limited extent, but when considering the constantly increasing knowledge of its occurrence and production, even within the past ten years, one may hopefully anticipate a much greater reduction in the future. In bringing this about the electrical furnace must necessarily play an important part. The character of aluminum fits it for many uses in which iron and steel are now employed. Moreover, aluminum is one of the most abundant elements known. As a silicate, its most common form, it is found everywhere; nearly all rocks contain it in the form of feldspar, and every clay bank is a mine of it, but at present only a few of its ores are commercially valuable by reason of containing a high percentage.

As to the future of the iron supply there need be little apprehension for many years to come, but when that time arrives, science will have been able to provide a suitable substitute for many of the uses to which iron and steel are now put.

Co-operative Mining.

At Park City, Utah, it is stated that a movement has been started to form a co-operative mining company, the stockholders and operators all being miners and members of the Western Federation of Miners. A company already organized, and known as the Aristocrat Mining Co., has offered a large block of stock for sale to the members of the union, offering as a premium 20,000 shares after 50,000 shares have been subscribed. Should the union accept the proposition they would have a majority of the stock and consequently control of the mine. This is somewhat of an innovation with labor unions, as in this case they would become operators as well as workmen. It will afford them a good opportunity of showing how financing a mine and practical mining should be done. If the proposition of the Aristocrat M. Co. is accepted the career of the company under the new management would be watched with interest.

CONCENTRATES.

THE weight of coal equivalent in heat production to one ton of dry wood is figured to be 836 pounds.

AN acid-proof cement that will withstand a high temperature might be made of litharge and glycerine.

THE nugget-like rock sample from Vulture, Arizona, is galena (sulphide of lead). It is covered with a film of carbonate and sulphate of lead, due to oxidation.

AT an elevation of 5000 feet above the sea the reading of the vacuum gauge of the condenser of an engine, back pressure four pounds per square inch, would be 16.62 inches.

THERE are in operation on the Witwatersrand 6325 stamps, the largest number being operated by the Rand Mines Co., which have 1240, and the next largest number being owned by H. Eckstein & Co., who have 1085.

SOUND will travel through steel at the rate of 15,470 feet per second; through iron, 16,822 feet; fir wood, lengthwise the fiber, 15,218 feet; white pine, 17,260 feet; air (15° C.), 1120 feet.

THE strongest explosive power of gasoline vapor is made by a mixture of one part vapor to eight parts air; of crude oil illuminating gas, one part gas to six parts of air.

THE addition of a small quantity of ferrovanadium has the property of raising the tensile strength of mild steel by from 50% to 66%. In some instances as small as .025% has doubled the tensile strength.

THE METRIC TON is nearer in weight to the English long ton of 2240 pounds than the American short ton of 2000 pounds. The metric ton contains 2204 62 pounds, and in the metric system is equivalent to 1000 kilograms.

THE rock specimen from Mazama, Wasb., appears to be a fine-grained quartz-diorite. The feldspars are much altered, but the structure and general appearance of the rock indicate that the above classification would be proper.

IN Siberia there are copper mines that produce beautiful compact masses of malachite, carbonate of copper ore. Such is the beauty of these minerals that they are polished and sent to market to be used for decorative purposes, such as table tops, mantel pieces, vases, etc.

THERE are said to be in use in the Joplin, Mo., district over 1000 machine drills, and in all the mines of the State over 1500. These are used in all the operations of mining, including shaft sinking, driving levels, putting up raises, stoping, and in almost every place where hand drills are ordinarily used.

GALENA (sulphide of lead) is slowly attacked by cyanide solutions, but all of the contained sulphur combines with cyanogen to form sulpho-cyanogen, a harmless compound, and lead comes into solution combined with that radical. There is no remedy known which will quickly relieve headache produced by nitrous oxide.

IRON ore occurring in veins may be located in the same manner as other veins or lodes, but when occurring in a flat sheet or as a superficial deposit may be located under the placer laws. A placer claim contains twenty acres, and a full lode claim, 1500x600 feet, contains about 20.65 acres. Claims located as placers have no extralateral rights, however.

A BARBED WIRE FENCE may successfully be used as a telephone line for a distance of 5 miles or a greater distance. No batteries are required other than those already in the telephone boxes. If the wires are insulated on china knobs, the result will be more satisfactory, as, unless this is done, in wet weather it is often impossible to carry on a satisfactory conversation, owing to loss of electricity.

DOUBTLESS the ore contains the metals in the proportion stated, but the smelter can not be expected to produce results in exact accordance with the assayer's certificate, as that institution might in an attempt to separate them lose three times what could be secured in treating the ore for the gold, silver and lead alone. No smelter cares to have much to do with "antimonial gold ore."

AN important discovery of minium (red oxide of lead) was recently made in the mine of the Progressive Mining & Development Co. at Leadville, Colo., W. L. Cooper manager. The mineral is found only massive and is deep red, with yellow streak. Its rarity makes it an important ore of lead, yet because of its limited production it has a value in the mineral cabinets and choice specimens are eagerly sought.

THE big garnets imbedded in schist and coming from Ft. Wrangel, Alaska, make the most interesting of any garnet specimens. These specimens come with a half dozen or more other fine big garnets imbedded in the

schist, and when some of the rock is cut from around the garnets, the garnets set out, making a most attractive and valuable mineral specimen. Such a specimen will bring several dollars and they are always in demand.

ONE GALLON of fresh water weighs 8½ pounds. One cubic foot of water contains 7.4805 gallons and weighs 62.37907 pounds. For convenience of computation, a cubic foot of water contains 7½ gallons and its weight is taken at 1000 ounces, or 62½ pounds avoirdupois; 320 gallons of water weigh one ton of 2000 pounds and measure 42 8 cubic feet. The water (320 gallons weighing one ton) would fill a cube measuring 3 feet 2 inches for each of its three dimensions.

MONAZITE occurs in granitic and gneissoid regions. It is found often in flattened or elongated crystals, often in rolled grains; color, hyacinth red, clove brown, reddish or yellowish brown; subtransparent to translucent; gravity about 5; hardness, 5 to 6.5; will not scratch glass readily; may be sluiced and caught in riffles the same as grains of iron. Sluices should have a low grade, or the greater part of the monazite is likely to escape, particularly if other heavier minerals are also present in the alluvial deposit. It occurs abundantly in North Carolina.

THE velocity of a stone dropped is zero at the start; at the end of the first second the stone is falling at the rate of 32.2 feet per second; at the end of the next second its velocity is 64.4 feet; at the end of the third second, 96.6 feet, and so on. The distance the stone falls in the first second is just one-half of the velocity it has attained, or 16.1 feet. To find the distance in feet that the stone will fall in any number of seconds, multiply 16.1 by the square of the number of seconds. Thus, in six seconds the stone will fall 579.6 feet.

THE zinc mineral smithsonite (zinc carbonate) occurs in a number of colors—white, grayish, greenish, brown, and sometimes blue and light red. The smithsonite from Laurion, Greece, are by far the finest specimens in the world. The Field Museum of Chicago owns what is doubtless the finest specimens in this country, coming from Greece. It is of a beautiful grayish color, and velvety. The United States produces smithsonite in some quantity, particularly in Arkansas, New Mexico and Virginia, but fine specimens are a rarity.

PROBABLY the finest specimen of yellow crystallized wulfenite ever produced was taken out of the Organ mine, in the Organ mountains, New Mexico, a few years ago. This specimen was exhibited at the meeting of the American Mining Congress at Milwaukee in 1900. It subsequently was bought by a Chicago man, who cut it into two pieces, the Field Museum of Chicago now owning the larger section, and Dr. Fargo of Los Angeles, Cal., is the possessor of the smaller. The crystals are of deep yellow, and with edges sharp and thin. In both of these specimens the crystals are embedded in a geode-like cavity and the bunches of crystals produce a brilliant effect.

FOREIGNERS can become, according to the law, owners of real estate in Peru, subject to the same duties, benefits, and rights as the natives. The code of mines, promulgated July 6, 1900, grants to all persons the right to obtain mining property and to be members of the boards of representatives. The number of concessions demanded should not exceed sixty. The greatest industrial development of Peru lies in its gold, copper and silver mines, its deposits of petroleum, and its mineral water sources. The mines belong to European and North American syndicates, which are engaged in vigorous prosecution of the works, so that a great output is expected for 1904 and the following years. A tax of 15 soles (\$7.30) must be paid every six months for each concession.

THE finest calcite crystals in the world are found in and about Joplin, Missouri. Crystals of enormous size are mined in the lead and zinc properties. Some of the finest specimens ever taken out have come from the John Jackson and other zinc mines in Chtwood Hollow near Joplin. From one of these mines there was recently extracted some exquisite specimens of calcite showing a fine deep amethyst shade far clearer than any other recent find and making most valuable specimens. The collection of calcites owned by the Field Columbian Museum of Chicago is the finest of any collection in the country, specimens of calcite from all over the world being represented. This collection comprises a hundred or more specimens.

CONCERNING the existence of a lode within a placer claim, Lindley on Mines says, Sec. 781: "Where a location of a vein or lode has been made under the law and its boundaries have been specifically marked on the surface so as to be readily traced, and notice of the location is recorded in the usual books of record within the district, it may be safely said that the vein or lode is known to exist, although personal knowledge of the fact may not be possessed by the applicant for a patent to a placer claim. The information which the law requires the locator to give to the public must be deemed sufficient to acquaint the applicant with the existence of the vein or lode; but a valid lode location can only be predicated on a discovery of a vein of quartz or other rock in place carrying valuable deposits sufficient to justify the expenditure of time and money for its development, and

such discovery must be shown before the location notice or its record will possess any force as against a placer patent." Where the owner of a placer claim discovers a vein within the boundaries of his claim he should secure the vein together with the extralateral right by making a lode location on the vein.

THE silicate of copper diopside is an exceedingly rare mineral, its occurrence in the United States having been limited to date to one small find at Clifton, Arizona, and that but a poor specimen. Diopside is considered by many to be the most beautiful of all copper ores, and this claim is substantiated by those who have access to some of the big mineral collections. The French Congo region of Africa is the only district that has produced diopside specimens in any amount, the specimens coming from there being of a beautiful emerald green color and crystallized in six-sided prisms, these crystals being at times quite transparent. Other localities in which diopside is found are Chile and Siberia. It is sometimes called emerald copper. Diopside specimens are rare, and to obtain a really fine one may take a collector years, as but few choice specimens come into market. Its composition is silica 38.2, cupric oxide 50.4, water 11.4; hardness 5 and gravity 3.28.

THE standard unit for flowing water in Montana and some other States is a solid or cubic foot of water, moving at the rate of a lineal foot in one second of time. Each foot in length of a flume 1 foot wide and 1 foot high (inside measurement), flowing full of water, would contain a solid or cubic foot of water. If this flume was placed on such a grade that the average rate of flow of water within it would be just 1 foot of distance for each second of time, it would carry a volume equal to the standard unit. This is often abbreviated into the two words second-foot. In considering this standard for flowing water, it is not to be concluded that a volume of a certain definite size is necessary. A flume 6 inches wide and 6 inches high, full of water flowing at the average rate of 4 feet per second, should also deliver 1 cubic foot per second. In general, the flow of any stream may be obtained by multiplying the width and depth of the water channel in feet by the average rate of flow in feet.

ZINC is a preventative of galvanic action in boilers due to the use of water containing acids—such, for instance, as salt water. It has also been found to be a preventative of scaling. In preventing the galvanic action the corrosion of the steel plates is lessened, for the zinc becomes the ultra-positive element as compared with the iron. The principal need to observe in placing zinc in boilers is to have a metallic contact between the iron and the zinc. The zinc can be introduced in the form of plates, and should be distributed throughout the boiler within the water space. It is not considered good practice to place it directly over plates in contact with the fire, for the oxide from the zinc dropping on these surfaces might cause overheating. In water tube boilers, thin narrow strips of zinc coiled around a mandrel, to form a helix, may be conveniently inserted in the tubes. As a rule, about 1 square inch of surface of zinc is used for every fifty pounds of water in the boiler. The zinc should be renewed every four months.

TWO STYLES of tailings samplers are in use and either of them is of value and practical utility. One works on the principle of the common rotary lawn sprinkler, the other is a device which automatically takes a sample from the foot of the amalgam plates below the battery. The former is operated by the force of the escaping stream of water. The tailings, collected from one or more batteries, are conducted to a hopper above the sampler. An upright iron pipe is fitted at the lower end with horizontally diverging arms, usually four in number. Three of these pipes are turned backward slightly, and the fourth has a downward discharge opening. The force of the escaping tailings drives the sampler around in the same manner as the familiar lawn sprinkler, the tailings being thrown outward from the center from three of the pipes. That from the fourth is discharged downwardly. A covered bucket is set directly beneath the circular path of the latter, the cover being provided with a slot, so that with each revolution of the sampler a small quantity of the tailings falls into the bucket beneath. At stated intervals the bucket is emptied and its contents dried and assayed. The second style of sampler is also an automatic device so arranged that a trough having a length equal to the width of the plate, at regular intervals passes beneath the lower lip of the plate, the entire stream of tailings falling into the trough for a moment. The trough, made of Russian iron plate, has an inclination to one side, and the tailings run out into a bucket or other receptacle set to receive the sample. The device may be operated by the power driving the mill, or it may be made to operate automatically by having an "over-balance" attachment which operates upon a small box becoming filled with water. When this occurs the sampler trough moves forward, and the water discharging from the "over-balance" at the same moment the trough recovers its original position. This device may be made to work as fast or as slow as desired. In milling each battery should be provided with a separate sampler, as there is often much difference in the ore passing through the respective batteries, due usually to the uneven distribution of fines and coarse rock in the mill bins. In some mines the fine rock is the richer, as at Cripple Creek, and in others it is poorer, as in some California mines.

Head-Works Framing.

Written for the MINING AND SCIENTIFIC PRESS by
CHARLES H. FITCH.

A vertical load upon two struts, as shown in Fig. 1, is divided between them. A vertical load upon a single inclined support creates a stress in the support greater than the load in the ratio of the length of incline to length of vertical, as shown in Fig. 2, and there will be an unbalanced force tending to push out the foot of the strut. A vertical load on two inclined struts is divided, and each half load creates a stress in its strut increased over the half load in the ratio of incline to vertical, as in Fig. 3.

But suppose that there was considerable variation in the inclination of the struts. By rigid rule, the effect would be a much greater stress in the longer strut. In a perfectly rigid system the longer strut would take such a stress, but all materials are elastic. If the longer strut was of rubber it would yield, and practically the entire load would come on the shorter strut. (See Fig. 4.) This would require a small force to be exercised horizontally to prevent the foot of the strut from moving. This horizontal component should be small, as shown in Fig. 5. We have already considered such a stress as being met by two horizontal framing pieces at right angles, in which case the stress as a diagonal is resolved into components in the directions of the framing pieces,

pendicular to this diagonal will cut the lines of framing and may be considered their base line, similar to the horizontal lines in Figs. 3 and 4.

The usual head-works frame is a tower, rectangular in plan, with posts vertical or having a slight batter, and, to meet the pull of engine upon the hoisting rope, a pair of inclined struts are patched on, like an afterthought, as indicated in Fig. 7. Sometimes, in place of the tower of four posts, a side or frame of two posts nearly vertical is used, and a pair of inclined struts is framed to these, as shown in Fig. 8. Another construction is shown in "perspective" in Fig. 9. This has two sides, each of three inclined posts, and admits of easy calculation of stresses and great strength for a given weight of lumber. A pyramidal form gives great strength, and a tripod will equalize stresses and so distribute the load, giving every post a share of the duty. A four-legged structure, like a four-legged stool, may bear only on three legs. We see, therefore, that the triangulation of forces by which stresses can be theoretically calculated for three members meeting at a point is a natural limitation, not an empirical one.

Referring again to Fig. 6, when the load is being hoisted the framing may be so disposed as to bring equal stresses upon the elements D-F and D-G, or, if D-G be shortened to obviate the use of long timbers, the greater stress may come on D-G.

It will not do to theorize on assumptions of absolute rigidity, because the piece which, by reason of length, weakness of bending or compressibility, yields

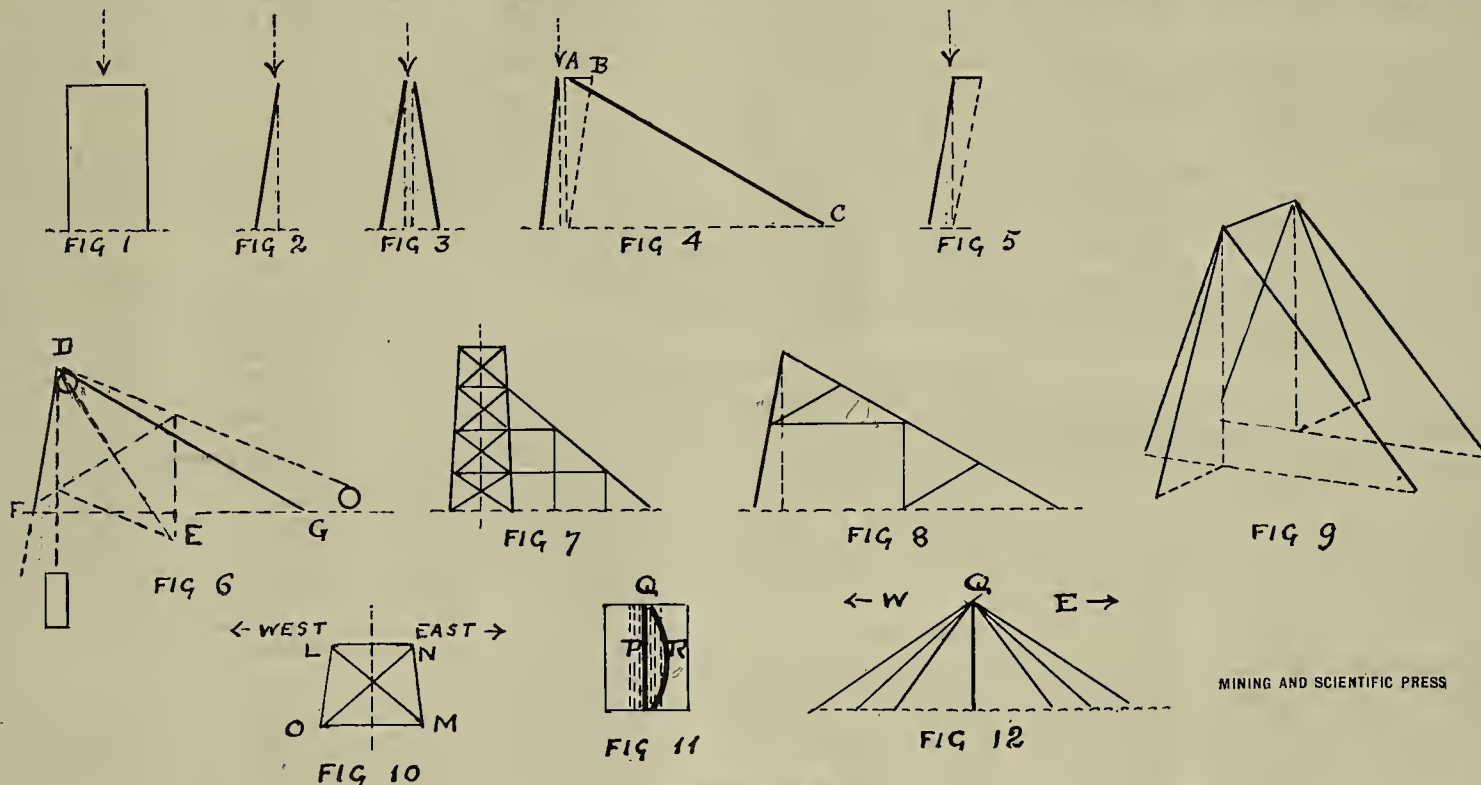
stresses tend to take most of the load, because they are most compressed and have a more rigid bearing. If, as shown in Fig. 11, we have a load concentrated at Q upon a steel rod, P, surrounded by a post of wood, concrete or other material, the rod would take most of the stress. The material about it would take a little, just enough to keep the rod P straight, and sometimes in compression, sometimes in tension, on either side of any vertical plane as vibrations passed through the structure. A rod, R, bowed out of line of stress would not take much load, and would create a bad reactionary load against its abutments.

Referring to Fig. 12, the load Q would bear almost entirely on the vertical center strut and little on the inclined struts. East or west winds, as indicated in plane of drawing, would produce tensile or compressive stresses in these members, however, and would render necessary either struts or else ties, such as the guys of a derrick or smokestack.

The cross timbers of a head-work are to be considered in the same way. Guys in tension might be substituted for them if the tension was carefully maintained.

Given the direction of a force, and the direction of the timber to resist it, we can see at a glance how much out of line the latter is, and the stress will be the greater the more the directions vary in a ratio determined from tables of angular functions, provided that there is no more direct member to take the stress and relieve the indirect member from the excessive stress that would otherwise come upon it.

But even if a man be innocent of trigonometry, or



Head-Works Framing.

the stresses in these being proportional to the sides of a right-angled triangle of the diagonal specified. In the inclined strut, as shown in Fig. 2, friction would prevent movement within the angle of repose, which varies with different substances under different conditions of pressure and lubrication.

The careful reader will here perceive a great discrepancy in rules. If the frame be perfectly rigid, the stress on the longer strut will be very great, and if it was raised until this strut was horizontal, it would become theoretically infinite. As a matter of fact, however, the shorter strut takes the whole load, with such assistance from the longer strut as is represented by a component of the stress in the shorter strut, indicated by the short horizontal line in Fig. 5. Therefore, referring to Fig. 4, the longer strut does not require to be heavy to resist a stress represented by A-C, but only light to resist a stress represented by A-B. In other words, the short strut takes a stress not equal to half the load, but more than equal to the whole load. It is compressed until nearly the whole load comes upon it, and creates in its oblique position a stress greater than the whole load. The longer strut is only compressed enough to take up a small component of this stress in the line of its direction.

Usually a hoisting engine is located to one side of the shaft, and the combined load of weight of superstructure and weight hoisted and pull on rope from engine is in some such direction as DE in Fig. 6, and is considerably greater than the weight hoisted. Neglecting the weight of superstructure, the direction of thrust is obtained by bisecting the angle made by lines of hoisting rope, and its force by projection completing a parallelogram and obtaining a diagonal D-E, such that vertical is to diagonal as load hoisted is to stress in direction D-E. Any convenient per-

most, will not take its due load, and the pegs, so to speak, will be knocked from under the legs of our theory.

Square or rectangular towers used, as they often are, for bins, and of no small weight themselves, have the effect of buttresses. They draw in or make less oblique the resultant load on the structure, making it more stable as well as providing storage space. Wind stresses have to be considered; but there is no difficulty about figuring these, as we can calculate them separately for the various members and simply add the stresses together algebraically—that is to say, get the grand difference of stresses in contrary directions due to all forces.

The cross braces are calculated by the triangular method, as has been described. They provide against wind pressures and buckling of posts. If a frame standing east and west, as in Fig. 10, was subject to a west wind, N-O would take a compressive stress and L-M would be a tie in tension. With an east wind, N-O would be in tension and L-M in compression.

If we have more than three members of a frame coming together at a point, some approximate assumptions must be indulged. Additional members may be placed so as to stiffen the frame, and be impossible of exact theoretical calculation or involve us in more complication than is worth while. We may figure such framing, neglecting some of the less important of these members, and may "use our judgment" in supplementary calculations to approximate their value.

"Using our judgment" may be objected to as a vague term. A critic may say: "Supposing we have no judgment, what can we do that is fairly correct?" I mean by using our judgment that we are to recollect that the struts in the direct line of

means of calculating triangles of forces, he can use some judgment—more than we sometimes see in mining structures. He can make an allowance for indirection about proportional with the length of the strut, compared with length of a strut in direct line of thrust. He can figure on about the square inches of lumber to take his load safely for posts braced at ordinary intervals, increasing the area for indirection. In this exercise of judgment he can save material. He will not put up a bastard or non-calculable structure unless the conditions are peculiar, such as the necessity of using a lot of small material. But if he was obliged to put up a structure with as many ribs as a wigwam, he would simply get them to bear as evenly and as close to the direct line of load as practicable and increase his factor of safety.

Iron Ore in North Carolina.

"Iron Ore Deposits of the Cranberry District, North Carolina-Tennessee" is an abstract from the descriptive text by Arthur Keith of the Cranberry Geologic Folio, just published by the United States Geological Survey. Deposits of magnetic iron oxide occur along a line passing through Cranberry in a northwestern direction. They begin near Old Fields on North Toe river and extend, with small intervals, south of Smoky Gap through Cranberry and on to Shell creek in Tennessee. The ore has long been worked and produces iron well known for its purity. At the Cranberry mines open cuts have been made at intervals over an area 900x300 feet and to the depth of 250 feet, with branching tunnels running in for considerable distances. The ore occurs as lenses dipping southwest. The ore is very free from phosphorus and sulphur. It yields an average of 42% to 46% of iron. The quantity of ore is more or less un-

certain, though the deposit has apparently a length of over half a mile. Large quantities are now in sight, and a large output is to be expected in the future.

Red hematite is found in this area on the east side of Bull Ruffin mountain. Little work has been done in the development of the ore, and its value and quantity are questionable. Specular hematite is found along the south slope, and also north and north-west of Beech mountain. The veins are small or of only moderate thickness. Brown limonite ores are abundant in the Tennessee district.

Mining in Bendigo.*

NUMBER II.—CONCLUDED.

Written by L. A. SAMUELS.

The diagrams Nos. 1 and 2 show the method of deepening the shaft in hard sandstone below 950 feet. Fig. 1 shows plan of shaft bottom and position of bores. Fig. 2 is a longitudinal section of bottom and lower portion of shaft, showing depth and direction of boreholes against the bedding planes of the strata,

FIG. 1.

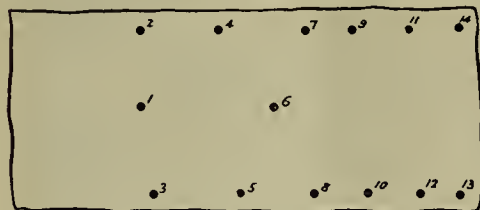
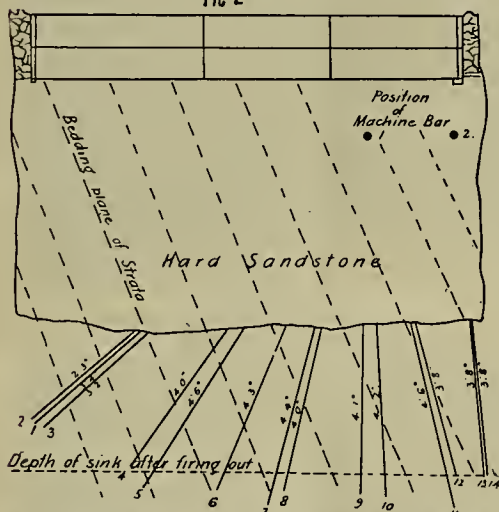


FIG. 2.



the shaft being sunk at right angles to the latter. The positions of machine bar, which are also of importance, are also shown. Bore Nos. 1, 2, 3 are called the "sink" holes. For boring these, the machine is placed under the bar in position No. 1. This is done for the purpose of providing as much of a "lift" to these holes as possible. The other bores are called stoep holes. For bores Nos. 4 to 12 inclusive, the machine is placed over the bar, which is shifted to position No. 2 for bores 13 and 14. The depth of each of the fourteen bores as shown in diagram is as follows:

	Ft. In.		Ft. In.
"Sink" holes, No. 1...	3 4	"Stoep" holes, No. 8...	4 0
" " " " 2...	3 3	" " " " 9...	4 1
" " " " 3...	3 3	" " " " 10...	4 2
"Stoep" holes, " 4...	4 0	" " " " 11...	4 6
" " " " 5...	4 6	" " " " 12...	4 8
" " " " 6...	4 3	" " " " 13...	3 8
" " " " 7...	4 4	" " " " 14...	3 8

Total length of bores—54 feet 7 inches.

Result of firing is the deepening of shaft by 3 feet 6 inches, and, as the rough area of shaft is fully 11x5 feet, there is a displacement of not less than 192 cubic feet of solid rock. Time occupied from beginning to completion of this work is twenty hours.

To accomplish this, only one drill is made use of at a time, as it is found that the use of two drills at once in a shaft of this size is unprofitable. But this drill is kept constantly going, except when firing takes place, and even then it is kept in position ready for starting again, as in the position which it occupies it is extremely seldom that it receives damage through blasting, and the loss of time and labor of removing the same and replacing it in position is thus avoided.

In each shift two shaft men are engaged to work the drill and perform the blasting. Besides these, there are two other men fully occupied in bottom, sending up mullock and water to the bottom plat, which is never more than 200 feet above them. These men also attend to tools and other requirements.

As soon as the three sink holes have been drilled the required depth they are fired, and drilling of Nos. 4 and 5 holes is at once proceeded with. While these are being bored the sink is cleared of mullock,

broken by the first three holes. After this, Nos. 4 and 5 holes are discharged, and in this manner the process is repeated until the bottom is squared up, after which the next sink is taken in hand and completed in the same manner.

In the plat above, one winchman is engaged in each shift and one lander or platman. The latter, receiving the mullock from below, trucks it and sends it to the surface. He also lands the water which flows into a cistern, from which it is raised, either by a tank or by means of a pump, to the main pump which discharges it at the surface.

The timbering of the shaft occupies, on an average, from four to five shifts at the beginning of each fortnight, according to the depth of timbering required. During this time no other work is being done in bottom of shaft. This is closely timbered, and centered or divided, with 2-inch sawn red gum slabs. A thickness of timber of 2 inches is considered quite sufficient in the hard Bendigo strata, except where, in a few isolated cases, the ground is subject to swelling, stouter timber is used.

The quantity of explosives, in the form of gelignite, used in the fourteen bores as described, was as follows:

Weight of cartridges used—1.6 oz. each. Ten cartridges weigh one pound.			
No. 1.....	8 cartridges.	No. 8.....	12 cartridges.
" 2.....	9 " "	" 9.....	12 " "
" 3.....	9 " "	" 10.....	12 " "
" 4.....	10 " "	" 11.....	14 " "
" 5.....	14 " "	" 12.....	12 " "
" 6.....	7 " "	" 13.....	12 " "
" 7.....	12 " "	" 14.....	12 " "

Total—155 cartridges. Weight, 15½ pounds.

The detonation is effected by means of electricity or time fuse. Some miners prefer the one method and some the other. As a rule, however, when the shaft is a considerable depth below the bottom plat, to which the men must proceed when firing, they are compelled to use only electric detonators.

The length of fuse required for the 54-foot length of boring may be put down at three and one-half coils of 24 feet each.

It will be seen now that to arrive at an estimate of the approximate cost of underground work per foot of sinking, on the above basis, is comparatively easy, and may be put down as follows:

Wages—			
One shaftman (foreman) at 9s 2d per shift, 2½ shifts.....	£1	2	11
One shaftman at 8s 4d per shift, 2½ shifts.....	1	0	10
Two men at 6s 8d " ".....	1	13	4
One platman at 6s " ".....	0	15	0
One winchman at 5s " ".....	0	12	6
	£5	4	7
Explosives—15½ pounds gelignite, at 1s 14½d.....	£1	1	3
Fuse—¾ coils at 7d.....	0	2	0
Candles—¾ pound per man per shift—7½ pounds at 6d per pound.....	0	3	9
	£6	11	7

Representing the expenses for 20 hours, or 2½ shifts, during which time 3½ feet have been sunk, or at the rate of per foot.....£1 17 9

To this has to be added per foot—

Timber—75 feet super red gum, prepared and milled, at 12s 6d per foot.....	0	9	4½
Cost of timbering per foot.....	0	4	6

Making a total underground cost per foot...£2 11 7½

This amount is, of course, considerably increased by surface and other expenses, steel, tools, etc., which may be safely put down at another £2 per foot. In the case under notice, no other work being in course of progress at the mine during the time of sinking, the actual cost, inclusive of all material, tools, surface expenses, management and office, was slightly over £3 10s per foot, but the fact must not be lost sight of, that a substantial saving was effected through the winze forming part of the shaft for a distance of 250 feet.

As has already been pointed out, a considerable amount of crosscutting is necessary at greater depths in the Bendigo mines, and, both in shaft-sinking and crosscutting, the mine managers on this field have displayed a healthy emulation to hasten the progress of such work where it is in hand. Crosscuts, about 5 feet wide by 8 feet in height, have frequently been driven from 60 to 75 feet per fortnight in hard ground, but it must be said that the system in vogue for this work, by boring out a face with twenty to twenty-four holes, has frequently been the cause of miners using quite an inordinate amount of explosives, "burning out the ground" as it is, not inaptly, termed.

Much unnecessary boring is avoided, considerable expense is saved, and better results are obtained by another method which has, in some cases, been adopted.

This necessitates the boring of only seven, and, in very hard ground, nine holes, in order to displace a face from 3½ to 4 feet in thickness, and as much as 92 feet of driving per fortnight has been done by its means.

In driving a crosscut by means of this method, particular care must be taken that the face of the drive is properly squared up, before firing out takes place. In particular, there should be no "toe" left in bottom of face. That is, the bottom of crosscut in front of face should not have any rising ground left

from the previous cut. It seldom happens that there is under this method, but should there happen to be, the same must first be removed.

The crux of its success, however, lies in the position, depth and direction, and further manipulation of the first hole to be fired. The position should be almost as near as possible in the center of the face; depth from 4 feet 6 inches to 5 feet. The direction should be straight ahead, that is, not pointing towards the sides, either right or left, and it should be almost horizontal, giving it just such a slight downward pitch so as just to allow it to hold water while boring.

From the bar, in the same position as from where the first hole was bored, two more are now put in, near each side of the face, slightly above No. 1 hole, and pointing slightly upwards, each about 4 feet to 4 feet 6 inches in length. Above these, and pointing towards the roof, two more side holes are bored in a similar manner, and should the ground be very hard, two intermediate holes are put in. In very few cases, however, are these two extra holes required. The machine bar is now removed and placed in position near bottom, to permit of a drill being worked from it under the bar, and from this, two bottom corner holes are put in, almost horizontal, with just a slight downward tendency. This completes the boring.

The first, or center hole, on which the success of the cut out depends, is now what the miners term being "hulled."

From three to five cartridges of gelignite are placed well into the bottom of the hole, carefully pressed home, and exploded.

This has no further effect than to pulverize the rock around the bottom of the hole, which is now carefully scraped and cleaned out again. The result is a fairly large cavity or widening of the bore in bottom. From three to five pounds of explosive, according to the hardness of the rock, is now inserted and carefully pressed down so as to confine the same into the smallest possible compass in the bottom of the hole.

In order to ensure the utmost effectiveness, the hole is subsequently filled with loose tamping, and to avoid the risk of missing fire, two detonators and fuses may previously be inserted. The result of the explosion, after these details have been faithfully carried out, is a displacement of fully 4 feet in thickness of rock for over one-half of the area of face extending from about 1 foot above the hole till nearly to the bottom, which latter may now be squared up by means of the two bottom bores already put in.

Cracks extend upwards, sometimes to the top of the drive, and the ground in the upper part of the face has received such a shaking that, as a rule, only very few cartridges are necessary in order to dislodge this portion, and to square the face which has thus advanced 4 feet. For the next cut, the bar is at once rigged up again and boring proceeded with, while the broken rock is, at the same time, removed.

The O'Meara-Lynch Mill, Tonopah, Nev.

Written for the MINING AND SCIENTIFIC PRESS by
A. J. MALLON, M. E.

During their Mizpah lease Lynch & O'Meara obtained as a natural consequence a large amount of what is considered in Tonopah low-grade ore. This ore will average from assays made by the writer between \$15 and \$22 gold and silver. Shipping such ore is out of the question when one considers the cost of hauling over 60 miles of desert.

The only possible solution was the erection of a mill and subsequent concentration of the milled ore. The problem of water was a serious one in this connection, but was finally settled by the tapping of the water channel at the wells about 4 miles south of Tonopah. The ore to be treated (about 400 tons as a test) was hauled to the above mentioned place and a Kinkead mill, with a crushing capacity of about eight tons daily, was erected by H. J. Kinkead, the present superintendent. A Frue vanner (6 feet) was installed to van the pulp.

This method proved successful and a shipment of concentrates was made on the 3d inst. to Salt Lake smelters, which will net the operators a goodly sum. The water used in crushing and vanning is pumped from a 75-foot well to tanks holding 8000 gallons. It is only necessary to pump every other day, as a reservoir is built directly below the concentrator, thereby settling the tailings. The partially clear water is drained off to a second settling tank, where a 6-inch plunger pump raises the water to the original tanks. In this manner a great saving in water is made, which is necessitated owing to scarcity of water in this district.

The power used is a gasoline engine capable of developing 4½ H. P. The Kinkead mill taking 3½, the Frue vanner ½, and the pump ½ H. P. respectively. This is small power to operate when considering the crushing capacity of the Kinkead mill. The consumption of gasoline averages twelve gallons daily, making one and one-half gallons consumed per ton of ore crushed.

Three eight-hour shifts (one man) and one extra laborer complete the working force. Taking tailings averaging \$5 and ore averaging \$20, this gives an extraction of 75%, which, considering the class of ore, is a successful extraction.

*Trans. Aust. Inst. Min. Engrs. condensed.

The Card Concentrator.

In the line of concentrating tables one of the latest is the invention of W. L. Card and F. S. Card of Denver, Colo., which is being manufactured and sold exclusively by The Hendrie & Bolthoff Manufacturing & Supply Co. of that city.

It is of the Rittinger type, and the improvements claimed are in the character of the table's surface; the compound nature of the stroke imparted by the mechanical movement; the manner of mounting the table so as to avoid vibration; the method of feeding the pulp and dressing water upon the table; the strength and solidity of all parts entering into its construction, and the large bearings and complete lubricating devices for all movable parts, thus insuring long life and immunity from expensive repairs and vexatious delays.

A description by the inventors is as follows: We regard as the most important feature of our invention the use of channels (see Fig. 1) instead of riffles (see Fig. 2) on the surface of our tables, which have

duced as the water flows across these channels, both by reason of their pan-shaped cross-section and the fact that they run even full, thus transforming the entire area of the table into a plane surface in so far as dressing action is concerned, while at the same time the mineral is traversing the hidden underlying channels, to the head of the table, under the protection of the overlying strata of gangue. The water over the entire surface of the table is as smooth as a mirror, showing at a glance how gentle its dressing action is upon the pulp.

Furthermore, by the action of the channels, the pulp is distributed over the entire surface of the table, every square foot of which is operative, there being no idle portions (covered with nothing but water), and hence we have not only greater efficiency, but also a greater capacity (as to tonnage) than any other concentrator in use to-day; and at the same time, by the action of these channels and our method of feeding the coarser pulp to the rear of and below the finer, we save a higher percentage of fine slimed mineral than has been possible heretofore. We use

smoothly as the cross head of a steam engine, without the slightest vibration to raise the slimes and promote their loss.

Aurite, and a General Theory of Gold Ore Genesis.

Written for the MINING AND SCIENTIFIC PRESS by
JOSEPH VOYLE.

In the Aug. 16, 1902, issue of the MINING AND SCIENTIFIC PRESS I described a newly-discovered alloy of gold with some self-selected associate metals, and gold's action in expelling, or exuding, and absorbing this alloy, asking: "What is this exude?"

Since then, by further researches on larger quantities, I have obtained a series of important facts, which I believe are entirely new. These facts have led me to consider the exudation to be a reversion to an original primary form, to which I have given the name of aurite.

Aurite is an instance of natural selection in metals; metallic gold is its natural host, from which, under definite favorable conditions, it purges itself by exudation, generally leaving its host in a refined condition, and, under circumstances favorable therefor, will return to its host, without loss of or addition to total weight or change of composition.

I find that aurite contains 60% gold. In the exuded form it is a greenish gray powder or pulverulent mass. In the metallic form its small beads are brilliantly colored—purple, scarlet, green and blue; larger quantities are variable in color, generally a purplish gray; scratching shows white metal. Fusing on a bone cupel makes no change in aurite. I found that some clays have a cupelling action on nearly all of its constituents, leaving the gold in a refined condition, except some refractory metals occasionally—not always—present. On a kaolin cupel these constituents are held in the form of a glaze; changes in color—green, scarlet and brown—come at different stages in the progress of cupelling. The brightening of the head indicates the finish. This bead is generally fine gold, but sometimes it tarnishes on cooling. I have taken this tarnished gold and by repeated liquations at advancing temperatures have finally obtained a metal that I could not fuse by any heat I can produce here; and I can heat an iron wire to incandescence and dissipate it in a shower of sparks.

As aurite maintains its identity of composition at a temperature far beyond the fusing point of gold, it could be present in the molten condition coexistent with the primary rocks, cooling with them to the solid form, and, at a suitable temperature, exuding into the pulverulent form, some of it passing, with the constituents of the primary rocks, into secondary and Tertiary rocks, to be also distributed in the sands and alluvium, the most minute particles being carried by the turbid waters into the ocean, there to be dissolved by the solvent constituents of the brine, or, on meeting clear water, be precipitated into the sands along the beach.

From the primary rocks and surrounding atmosphere there would be in action every possible means of distribution—solid, liquid, mechanical and chemical disassociation and reassociation—furnishing a basis of truth for every known theory of gold ore genesis.

Aurite is composed of at least six different metallic elements. By solution in acids and precipitation, I have separated these six elements and find that they are reducible to the solid state. Four of the precipitates are pure white, resembling precipitated chalk. Two of these white precipitates are sensitive to light. One becomes a dark violet color, the other a deep purple. By heat the violet precipitate yields a bright gold bead; the purple gives a tarnished gold head, which brightens when dropped into dilute muriatic acid. The other two white precipitates are permanently white in full sunshine; both yield, by heat, gray metal—one a light gray, the other a darker gray. Fusing both together, a medium gray metal is obtained, which on furnishing polishes to a brilliant gray surface, which on exposure to the air takes on a purple tinge. A purplish brown flocculent precipitate yields a bright gold bead. The residue is gold, which, on fusing and slowly cooling, shows a brown tinge, which disappears on immersion in dilute muriatic acid, leaving the gold with a brilliant surface of natural color. On a new white bone cupel, under a hot blast, this gold gives two sublimate; one is a purplish pink, the other a yellowish brown.

To learn some of the results of mechanical disintegration of aurite, I put some of the exude in an agate mortar with water; by grinding, a turbidity was produced; the aurite gradually changed color, resembling yellow ochre. Continuing the grinding, removing the turbid and adding clear water, the residue became very heavy and bronzed in appearance; when the water remained clear, the residue was in a state of exceedingly minute division; on fusing it gave tarnished metallic gold. The precipitate from the turbid water gave a gray metal.

In this grinding my fingers were wetted with the turbid water and I found that smooth feeling given by alkali. As potash would be supplied by granite, I added caustic potash to the water and took another charge of exude. The same result was obtained in

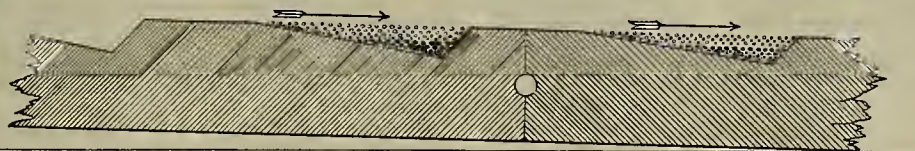


FIG. 1.

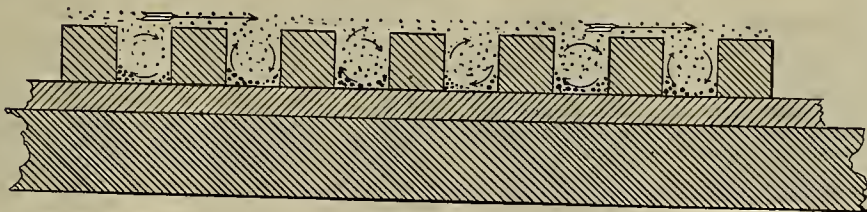
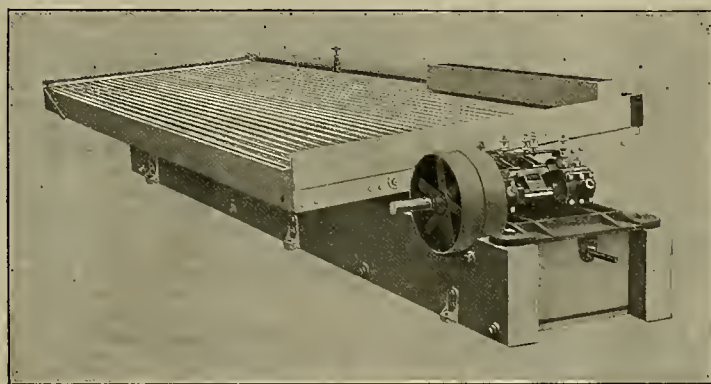


FIG. 2.



The Card Concentrator.

an active area of 5 by 15 feet, or 75 square feet in all. These channels are twenty-five in number, extend the full length of the table, and those adjacent to the upper, or feed side, are the narrowest and shallowest, the width and depth increasing progressively from the feed to the tail side of the table. They have the same obtuse angled cross-section as the lower operative corner of a gold miner's prospecting pan, and are widest and deepest intermediate of their ends, preferably about one-third their length from the heel or feed end of the table, and both narrow and shoal from this intermediate widest and deepest point to each end of the table. Thus the channels below the feeder expand in both depth and width, so that the rear one-third of the table's surface becomes a precipitating or stratifying zone, while the forward two-thirds, traversed by the narrowing and shoaling portions of the channels, constitutes an ore dressing zone. In the former the pulp constituents are stratified according to specific gravity with the mineral (from the coarsest to the finest slimes) gathered in the lowermost corner of the pan-shaped channels; this result being greatly facilitated by the tendency of the pulp constituents to separate as they move forward in the expanding receiving ends of the channels below the feeder, as the slimes (assisted by gentle agitation) very readily sink to the bottoms of the channels through the ever enlarging interstices among the particles traversing this rearward zone of the table's surface. In the latter, or dressing zone, comprising two-thirds of the table's surface, in which the channels narrow and shoal (while retaining the familiar and unexcelled pan-shaped cross-section throughout), the superstrata of sand are gradually raised into the cross-flowing current of the dressing water, whereby the gangue is dressed off over the tail side of the table layer by layer without in any way disturbing the sub-stratum of mineral, which follows the channels up to and over the head of the table.

There are no "eddies nor counter currents" pro-

duced as the water flows across these channels, both by reason of their pan-shaped cross-section and the fact that they run even full, thus transforming the entire area of the table into a plane surface in so far as dressing action is concerned, while at the same time the mineral is traversing the hidden underlying channels, to the head of the table, under the protection of the overlying strata of gangue. The water over the entire surface of the table is as smooth as a mirror, showing at a glance how gentle its dressing action is upon the pulp.

Furthermore, by the action of the channels, the pulp is distributed over the entire surface of the table, every square foot of which is operative, there being no idle portions (covered with nothing but water), and hence we have not only greater efficiency, but also a greater capacity (as to tonnage) than any other concentrator in use to-day; and at the same time, by the action of these channels and our method of feeding the coarser pulp to the rear of and below the finer, we save a higher percentage of fine slimed mineral than has been possible heretofore. We use

The foundation, or sub-frame, is heavy and substantial, well framed and bolted together. All bearings in the movement are $1\frac{1}{8}$ inch by 6 inches, and the table is carried by six self-lubricating babbitted sliding boxes, traversing two cold-rolled steel track rods, $1\frac{1}{8}$ inch in diameter, so that it moves as

much less time. I then took about twenty grams of exuded aurite and ground it for hours on a porcelain slab, watching the changes as they came, thus obtaining a history of the incidents in the progress of one form of mechanical disintegration of aurite, obtaining evidence of cohesion of grains in masses, formation of flakes of fine gold, adhesion to agate, iron, copper and to silver.

The gold reduced to this minute state of division, when rubbed between the fingers, reminds me of graphite by its smoothness; its heavy weight causes it to find the bottom in clear water, and its minuteness enables it to enter minute cracks and to assemble in any little pit or lower level to which water may wash it, and where, by pressure and surface friction, it may be formed into coherent masses.

I have cut placer nuggets in pieces with a fine saw and have found some of them to be only an outside skin, enclosing a pulverulent mass of minute grains of gold.

Minutely divided gold is readily picked up by some kinds of clay and carried along by and deposited with it. I have found clay, deposited by streams of water coming from gold mines, highly charged with gold in minute division. I have found microscopic gold in clay slimes from a quartz mill, the clay assaying \$16 per ton in gold.

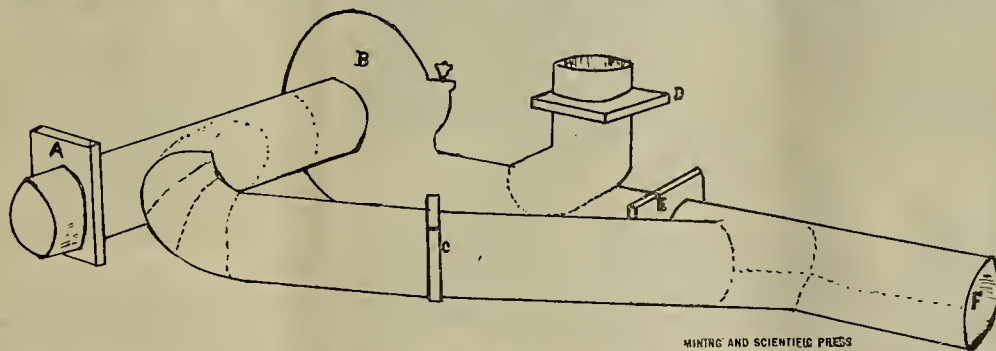
In my placer mine, during the noon hour, when the water was shut off, except a small stream, I have seen small eddies formed at the drop from box to box; these eddies of clear water sometimes gleamed bright in the sunshine, by reason of the fine gold concentrated there. Touching an eddy with my finger would cause the gleam to cease; waiting awhile, I could see the beginning and growth of a new gleam. I could never catch any of this fine gold that the clear water was carrying away.

My deductions are that, from a geological point of view, we have in aurite a universal primary origin for all gold, both as metal and mineral; a realization of the hitherto mythical mother of gold, with possibilities of modification to all known forms of metallic gold and gold ores and to many unknown forms; that, from a chemical point of view, we have a definite basic origin, as far as gold is concerned; that, from a metallurgical point of view, we have a widening of possibilities and a basis for improved methods of testing for, assaying for, and refining of gold, and also valid reason for considering every form of rock and earthy matter a possible carrier of gold in some one of the many variations of aurite.

Jacksonville, Or., May 27.

An Exhaust Fan and Blower.

In mine ventilation it is often desirable to have an exhaust fan to draw foul air from the workings. The most common practice, however, is to force fresh air from the surface into the mine by means of a rapidly revolving fan. Strangely there is much difference in opinion as to the relative merits of the two systems of ventilation, which may be considered *prima facie* evidence that both the blowing and exhaust fans are efficient. The accompanying sketch is that of a combined blower and exhaust. By use of the gates shown the fan may be made to drive a current of pure air from the surface into the mine, or draw from it the foul gas-laden air, by a different arrangement of the gates. For instance, normally the fan is a blower, indicated by B. To be utilized as such open the gates A and E, closing C and D,



Sketch of Combined Blower and Exhaust.

and the air will rush into the blower through A, and be driven out through F into the main pipe line leading into the mine. When it is desired to exhaust from the mine this may be quickly accomplished without stopping the blower or changing its direction of rotation, by closing E and A and opening C and D. The foul air is then drawn through the main line to F, and on through the gate C into the blower B, the air being driven out at D.

Many mine superintendents think better ventilation is secured by exhausting the air immediately after blasting, and later when most of the foul air has been removed, fresh air may be forced directly to the face by reversing the gates at the blower. The theory of this is that in driving fresh air through the pipe into the works a current of air sets outward through the workings to shaft or tunnel, contaminating every foot of the working on its way out with

powder gas and other impure substances. If this is drawn out through the pipe line fresh air will enter through the workings, giving a supply of fresh air throughout. With the interchangeable arrangement as shown, either method may be employed, or both successively.

Gold Ores of Ontario, Canada.*

Written by CHARLES BRENT, M. E.

The gold fields of Western Ontario are situated on what is regarded by geologists as the oldest portion of the earth's crust now exposed.

The formations are entirely Archaean and are two in number, viz., the Laurentian and the Huronian, the latter being subdivided into the Couchiching and Keewatin series. The term Laurentian is used by Canadian geologists to designate in a petrographical and structural sense the crystalline, generally acidic, granitic or gneissoid rocks underlying the Huronian.

The Huronian of Western Ontario—in its lower series the Couchiching—consists wholly of sedimentary shallow water deposits of clay and clayey sands, now almost wholly converted into gray and brownish gneisses and mica schists, but in places merely consolidated into sandstones showing little or no alteration.

The upper or Keewatin series is largely composed of eruptives and their products, with important sedimentary deposits, now occurring as conglomerates, quartzites, grits, breccias, graywacks, slates and limestones.

The lower Archaean occurs in large isolated areas, more or less surrounded by the schists of the upper Archaean, the latter forming a rough network around the Laurentian areas.

The Huronian series dip away at high angles in every direction from the central Laurentian bosses, forming synclinals between the granite areas, and now showing sections by which the geological history of the region has been worked out.

The whole mass of the western Huronian series was once floating on a viscous granite magma which, under the varying weights of the Huronian strata or from some deep-seated internal force, swelled up into the great bubble-like domes, allowing the floating strata to sink into the spaces between. As the domes pushed upward, the surface strata were stretched, fissured, sheared and contorted according to their position with regard to the rising masses which, by friction with the older strata, had their outer cooling surfaces drawn into a sort of rough parallelism with the shear planes of the outside rocks, thus forming the gneissoid margins which almost invariably surround the granitic masses. At the same time the margins of the granite masses were affected by the contact with the basic schists becoming themselves more basic and darker in color. Felsitic dikes were at the same time injected into the fissures of the Huronian formed by the stretching and fracturing of the older rocks.

It must be supposed that these granitic magmas, though possessing fluidity, were only hydrothermally fused, since all along the edges of the contact angular fragments and slabs of basic Huronian rock,

formations lying on their sides, it may be inferred that these Archaean mountains were comparable in height to the greatest elevations of the present day. Lawson estimates the thickness of the Huronian rocks at 50,000 feet, and it is thus probable that the summit of these oldest of earth's mountains rose many miles above the present level.

Dynamic disturbances of post-Archaean times have apparently been rare in this district and are confined to the injection of a few diorite dikes and the fissuring and faulting of the rocks in the immediate vicinity of these. It must not be assumed from this statement that there has been no movement in the rocks during post-Archaean times. The clastic character of the quartz in most of the ore deposits, and the shattered pyrites, often of different ages, constantly occurring in the veins, show that movements have taken place which, however, are probably rather of secular than of dynamic character.

By the process of denudation which culminated during the glacial epoch, these great elevations have been reduced to an approximately level plane lying about 1200 feet above sea level, which presents at the present day a most interesting section through the base of this group of ancient mountains. This plane is diversified by numerous basins scooped out of the softer rocks, which are now occupied by the complicated lake system of the district.

It may be noticed that the chains of lakes conform generally to the strike of the Huronian rocks, which is approximately that of the direction of the glacial flow.

Post-glacial changes have been very slight over the entire region, as is evidenced everywhere by the freshness of the glacial strata and by the existence all over the district of brightly polished surfaces of rock which are just as smooth to-day as they were when the retreating ice sheet left them bare to the sky. This brief review of the geological history of the district will serve to make plain many peculiarities of the ore deposits and ores of this oldest of all the gold fields.

The disturbances of the Archaean period alone are responsible for the general geological arrangements we find at the present day, and also for the folding, shearing and formation of the fissures, which, by subsequent circulation of hot and cold waters, have been filled with quartz and other minerals which form the ore deposits of western Ontario.

The leveling of the Archaean mountains which took place through the long ages preceding the glacial epoch was completed during that period and the whole mass of decomposed material swept away to the south and west, to be distributed over half a continent, leaving only the solid, unaltered bases of the mountain group.

1. General leveling has left no great elevations. There is, consequently, no post-glacial drift and the ore deposits are in plain sight. What is practically a deep-level section of the ore body is laid bare with all its characteristics, and since it is axiomatic in mining that, "as the length is, so is the depth," the underground behavior of these ore bodies can be predicted with almost absolute certainty.

2. The contacts between the granites and traps, as the Laurentian and Huronian formations are commonly called, are always in plain sight, and since it has been established by actual work that these contacts are in some way connected with the presence of gold in the ore bodies in the vicinity, a useful guide is always at hand in exploring new areas.

3. There is practically no surface decomposition or surface enrichment to be met with in the entire district. A few feet of sinking, as a rule, reveals the character of the ore, and the character is maintained in depth.

4. There is no "water level" such as is commonly met with in other mining districts below which decomposition ceases and the ore changes in character. If an ore is found to be "free milling" on the surface it will retain that character to an indefinite depth.

5. The solidity of the rock in this district is such that very little timber is required, and, although shafts are commonly sunk for hundreds of feet within a few feet of the shores of great bodies of surface water, no trouble has been encountered from an excess of underground water.

6. The rocks of this district are the hardest known to the mining world, and more steel is used both in mining and crushing than in any other part of the world.

7. The absence of any considerable elevations and the consequent lack of rapid streams, coupled with the facts that there is no loose material except glacial drift, would seem to preclude the probability of any areas of placer ground being found unless the streams which must have flowed to the south from the retreating southern edge of the ice sheet during the close of the glacial period have concentrated the gold contents of some of the terminal moraines.

As has been mentioned above, the most promising auriferous deposits occur on or near the contact of the Laurentian and Huronian formations, but gold has been found as well in veins in granite areas far removed from any contact, and benches and segregations of gold-bearing quartz are found everywhere in the Huronian schists with no apparent connection with any later eruptive.

(TO BE CONTINUED.)

*Trans. Canadian Min. Inst.

The Diesel Engine.

There are four recognized means of generating power for industrial purposes. These are steam engines, water wheels, electrical generators and motors, and gas engines. Each of these has numerous types, all have their staunch adherents, and all are successfully employed for the purposes indicated—

directly into the cylinder. There is no boiler or any other of the appliances necessary to a steam plant, but there is required a small air pump and its appurtenances. No unusual skill is necessary to operate and care for these engines. Any mechanic of ordinary intelligence can in a short time become fully competent. The usual care may be entrusted to a low-priced attendant, provided a skilled man is avail-

count of the cost, would only be used in an emergency. The oil is forced into the engine cylinder by a small pump, which is under control of the governor, the regulation being effected by varying the amount of oil supplied by the pump. This method of regulation is more effective than that used on steam engines, therefore the Diesel engine readily meets all requirements in this line.

The fuel-cost saving of Diesel engines over steam engines will, of course, depend upon the relative cost of oil and coal in a given locality, and also upon the type and size of steam engine.

The essential principle upon which the Diesel engine operates is that it is impossible to compress air without increasing the temperature of the air under compression; and that if oil is introduced into air at a certain temperature or above it, it must ignite and consequently burn. The degree of compression used in the Diesel process heats the air to about 800° Fahrenheit, a temperature at which crude oil burns completely without residue in the presence of a sufficient amount of air. The Diesel engine does not operate by an explosion, as is the case with the ordinary gas or internal combustion engine of other types. There is no mixture of combustible elements in the cylinder excepting at the moment when the combustion is intended to begin. There is no explosion and there are no ignition devices of any description, the machine being a simple caloric or heat engine, using air as a medium of expansion instead of steam. Steam has received heat from the fuel at the boiler. Air in the Diesel process receives heat direct from the combustion of oil fuel mixed with the air in the working cylinder.

The engine operates on the Otto cycle or four-stroke principle, the first stroke filling the cylinder full of air at atmospheric density. The second stroke compresses the air to about 35 atmospheres. At the point of highest compression, the air is practically in an incandescent condition. Just at the reversing point in the stroke of the piston, a certain quantity of oil is sprayed through an atomizer in the shape of mist, but not vapor. This oil is immediately ignited and burns slowly through a limited portion of the stroke. The expansion of the air and gases completes the third or working stroke, and the fourth stroke ejects the gaseous products of combustion, clearing the cylinder for a repetition of the cycle.

Harron, Rickard & McCone, of San Francisco, Cal., are Pacific coast agents, where the Diesel engine may be seen, and full particulars obtained.

Electric Furnaces for Very High Temperatures.

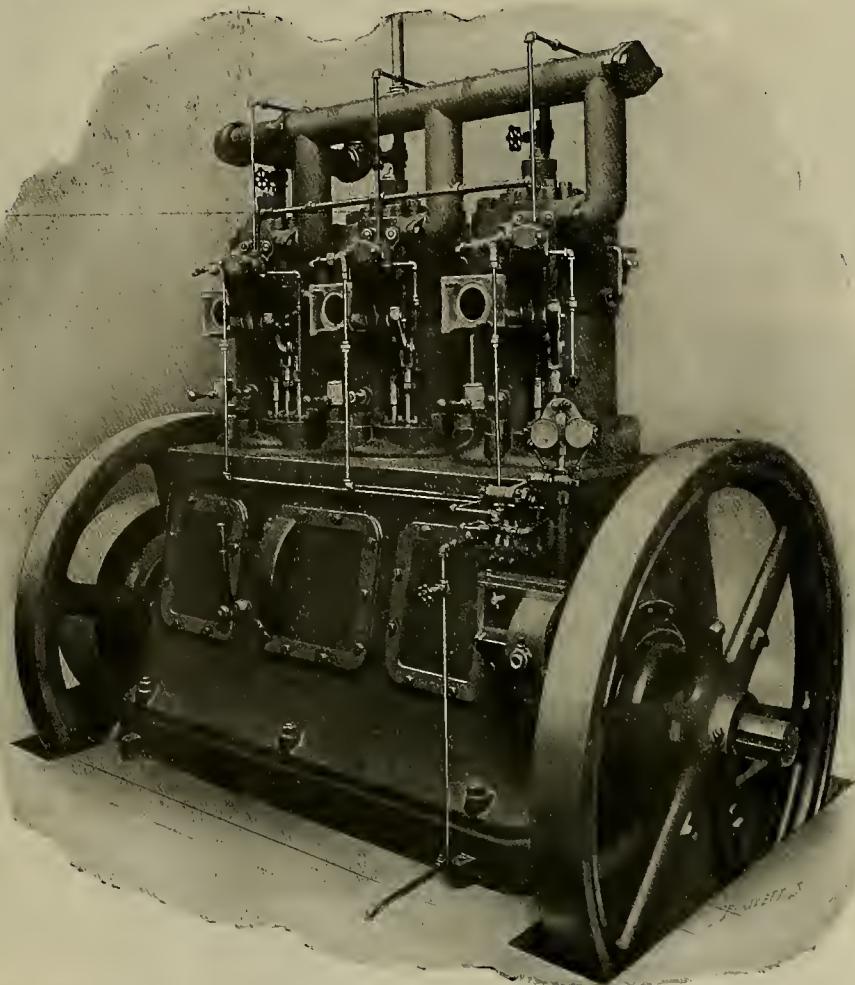
There are few inventions in the electrical field which have benefited the chemist and metallurgist more than that comprised under the general title of

"electric furnace," says J. Wright in Cassier's Magazine for June. Up to, comparatively speaking, a few years ago, the highest attainable temperature by any known artificial means was 1800° Centigrade, or, possibly, with exceptional facilities and the exercise of great care, as high a temperature as 2000° Centigrade may, in some cases, have been attained, though the exact limit is questionable. Certainly it does not rise much above the latter figure. Thanks, however, to the indefatigable researches of Moissan, Siemens, Borchers, Cowles and some other investigators, we now possess a means for the artificial production of temperatures far above this limit, which enable us to fuse and otherwise treat commercially such hitherto refractory substances as chromium, platinum, carbon and even the once indestructible crystalline form of that element—the diamond.

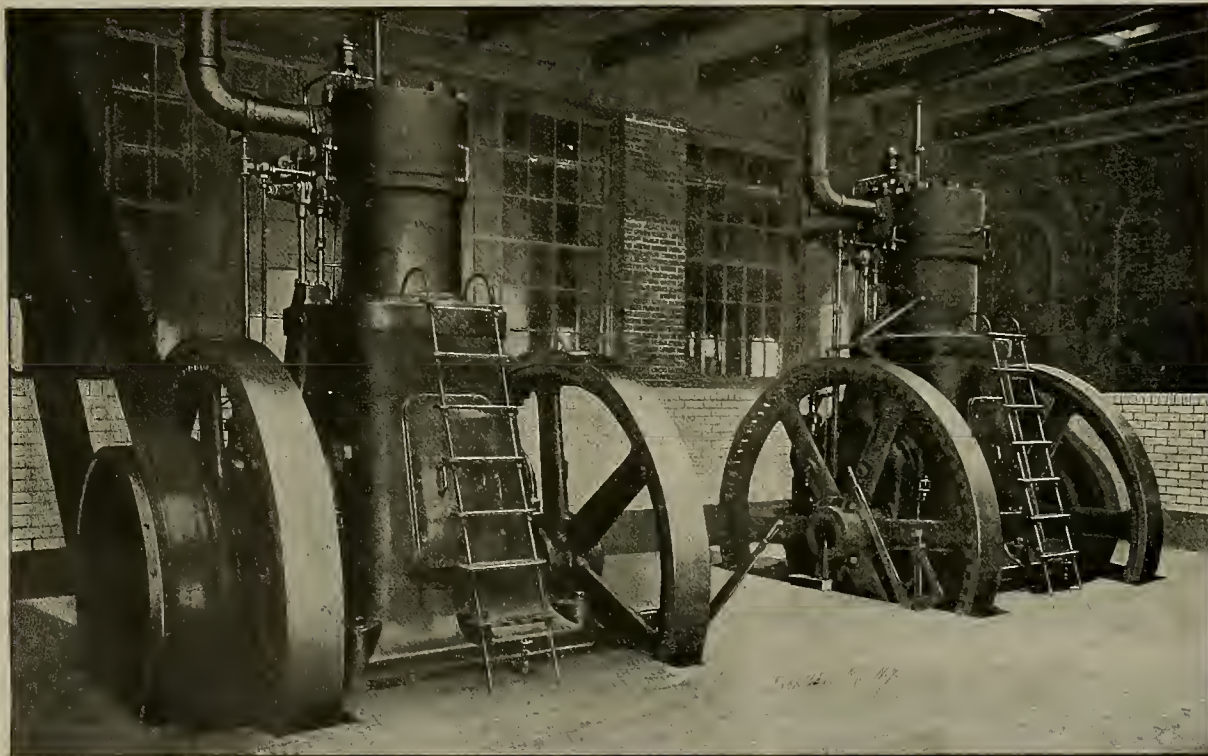
Generally speaking, electric furnaces may be divided under two main headings—namely, those in which the heating effect is produced by the electric arc established between two carbon or other electrodes connected with the source of current, commonly known as arc furnaces, and those in which the heating effect is produced by the passage of the current through a resistance, which either forms part and parcel of the furnace proper or is constituted, by a suitable conducting

train, of the material to be treated in the furnace. The principle of this latter type is analogous to that involved in the heating to incandescence of the ordinary electric lamp filament, and such furnaces are, as a class, known as resistance furnaces.

The experience of late years in the construction and use of electric furnaces trends towards the establishment of the resistance furnace as a type more readily capable of efficient regulation.



A Triple Diesel Unit.



Two Single Diesel Units.

creating power for industrial uses. The low efficiency of steam engines has led to experimentation and the construction of gas engines. These are as numerous in design as any of the other various types of engines. One of the latter that is at present attracting considerable attention is the Diesel engine, manufactured by the Diesel Engine Co., 11 Broadway, New York City.

The Diesel engine is a self-contained apparatus, operating by the combustion of liquid fuel pumped

able for occasional inspection and care in an emergency. There is nothing like the responsibility involved in the use of a steam boiler.

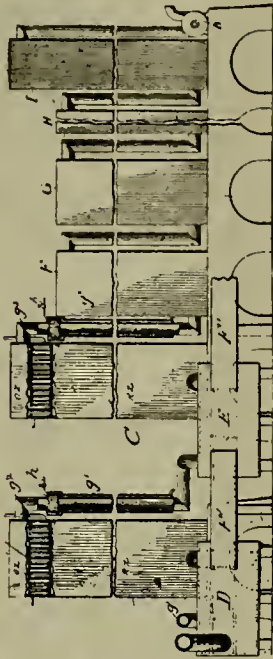
The fuel used may be crude petroleum, "fuel oil" or kerosene, the efficiency being substantially the same with either. The crude oil, on account of its low cost, will be used in districts where it can be readily obtained. Doubtless the supply will become generally available as the demand increases. Fuel oil can be obtained everywhere. Kerosene, on ac-

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 2, 1903.

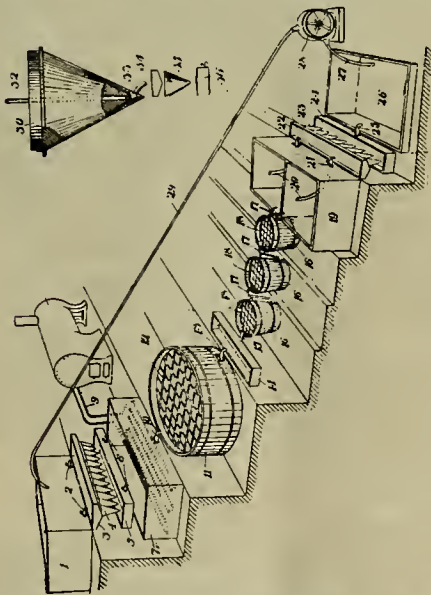
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METHOD OF MAKING SULPHURIC ACID.—No. 729,643; M. Neumann, Hamborn, Germany.



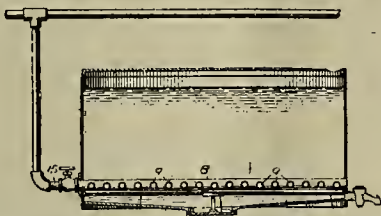
Method of making sulphuric acid, consisting conducting acid-producing gases through plurality of Glover towers, and through alternate heating and cooling zones intermediate of towers, temperature successive heating zones being higher, poorer the gases are in sulphurous acid and richer they are in oxygen.

PROCESE OF REDUCING AND SEPARATING SILVER.—No. 729,760; G. V. Guzman, Sucre, Bolivia.



Process extracting and separating silver from ores, subjecting ores to action of preprovided solution containing predetermined quantities more than one of chlorides of copper, passing resulting solution through reducing agent, and removing and collecting metallic silver from reducing agent.

APPARATUS FOR USE IN EXTRACTING METALS FROM ORES.—No. 729,819; J. F. Webb, Denver, Colo.



Apparatus for extracting metals by chemical process, comprising tank provided with filter bottom and perforated pipe placed within tank above and near

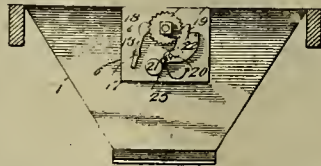
filter bottom and connected with air supply device, perforations being arranged to discharge streams of air upon bottom.

UNDERREAMER FOR DRILLING OIL WELLS.—No. 729,743; M. H. Dunn, Fullerton, Cal.



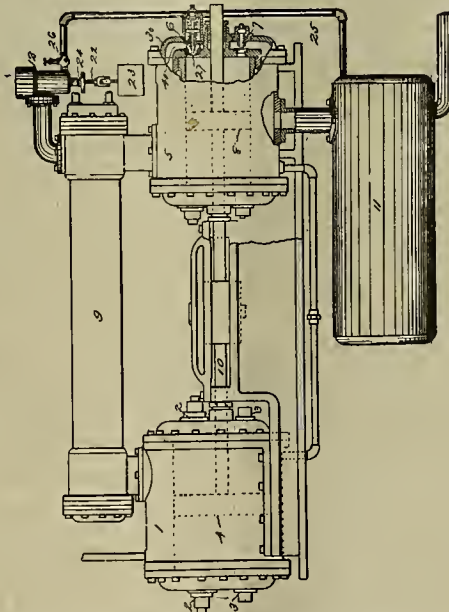
In underreamer, combination with body, of bits pivoted thereto, means spreading bits from body, and guide ribs located on outside of bits and extending longitudinally thereof and tapered or beveled both ends, whereby entry of underreamer into tube facilitated and tilting of reamer prevented during transit in tube.

ATTACHMENT FOR WINDING SHAFTS FOR DUMPING DOORS FOR CARS.—No. 729,746; A. Filer, Altoona, Pa.



Combination with winding shaft and ratchet wheel fixed on shaft and having squared hub piece, of pawl to hold ratchet wheel against return movement, stem of pawl being pivotally supported and standing approximately vertical and adapted to engage ratchet wheel by gravity, and pivotally mounted flat-curved pawl arm provided with plurality teeth to engage ratchet wheel and weighted at lower end beyond pivotal support, and locking means to lock pawl arm in engagement with ratchet wheel.

UNLOADING MEANS FOR AIR COMPRESSORS.—No. 730,121; E. Hill, Norwalk, Conn.



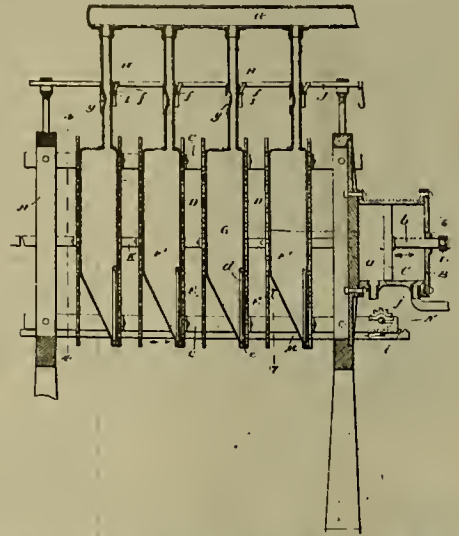
In multiple stage compressor combination with cylinders operating at different pressures, escape valve controlling outlet from duct between cylinders, communication between system beyond high pressure cylinder and escape valve, whereby escape valve is moved to open outlet from interduct when pressure system beyond high pressure cylinder exceeds predetermined maximum, and valve controlling opening into high pressure cylinder and adapted to be rendered inoperative by the drop of pressure resulting from opening of escape valve.

AGITATION TANK.—No. 729,806; J. Stoveken, Cripple Creek, and L. Stoveken, Florence, Colo.

Combination of tank having outlet adjacent to top, wings connected to and extending inwardly from vertical wall of tank, conduit leading from point adjacent to bottom of tank, having lateral opening adjacent to lower end, central vertical cylinder arranged in tank, piston movable in cylinder, and having rod extending through upper head thereof, gear disposed above tank, adapted be connected by

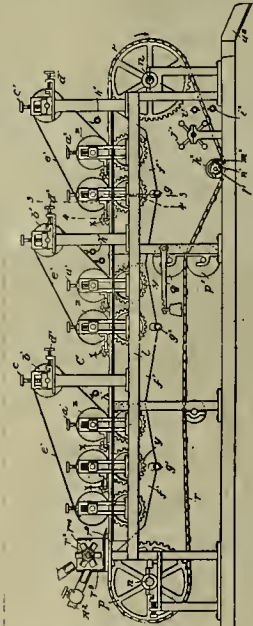
driving connection with motor, shaft stepped on piston rod, and keyed to and adapted move vertically through gear, agitating means carried by shaft, and comprising blades disposed below wings, and curved in direction of length and inclined in direction of width, connections between outer portions of blades and head on shaft, connections between inner portions of blades and shaft, and pipe communicating with cylinder below piston, adapted be connected with source of fluid pressure supply.

FILTER PRESS.—No. 729,807; J. Stoveken, Cripple Creek, and L. Stoveken, Florence, Colo.



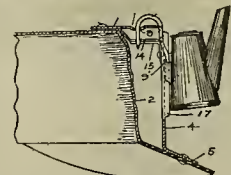
In filter press, combination of bag having inlet for material pressed, also discharge gate, means for pressing bag and for holding gate closed while bag is being pressed.

METALLURGICAL FILTER.—No. 730,195; J. Stoveken, Cripple Creek, and L. Stoveken, Florence, Colo.



A filter comprising frame having parallel ways at upper side, belts having upper stretches disposed in ways, means for driving belts, endless filter cloth interposed between and connected with belts, rolls mounted in frame and disposed below upper stretches of belts and filter cloth, idlers for holding upper stretches of belts down in engagement with rolls, rolls arranged above and adjacent to upper stretch of filter cloth, upper roll, belt passed around rolls above and adjacent to filter cloth and upper roll, means for supplying water to belt.

LAMP HOLDER FOR MINERS' CAPS.—No. 730,076; C. R. Anderson, Allegheny, Pa.



Lamp holder comprising angular support having top aperture rearward from angle thereof, top portion forward from aperture adapted to be embraced by and sustain lamp hook which depends through aperture, guide beneath top portion having backwardly and forwardly extending slot to receive depending end of hook.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

A. Raymer and E. Hardy of Los Angeles, Cal., have begun operations on the Windham Bay Chief mine at Windham Bay. They have shipped an ore crusher, water wheel, steel hydraulic pipe and other machinery, and will have the mill in operation this season. There are six companies operating at Windham Bay this season. The California-Alaska G. M. Co., of Los Angeles, Cal., is putting in machinery and will build a 5-stamp mill this season. The company owns claims on the same ledge on which the Yellow Jacket M. Co. is putting up three mills of four 1000-pound stamps each, with seventy-five tons capacity per day. Large bodies of low grade are being found. The mines are said to require little timbering and water power is available to drive machinery.

The Alaska-Juneau mine, on Silver Bow Basin, near Juneau, has resumed machine working in the tunnel. There are fifty men at work.

S. I. Silverman, manager of the Brown Alaska Co., near Lyman Anchorage, Prince of Wales Island, says he has men at work clearing the site for a smelter of 400 tons daily capacity.

ARIZONA.

COCHISE COUNTY.

A body of sulphide ore is reported struck in the tunnel being run by the Chiricahua Dev. Co. in the Chiricahua mountains, near Douglas, showing 3 feet of 6% copper ore. The company is composed of Michigan copper men, Kingman Bros. of Marquette being the principal holders. The company had a diamond drill at work prospecting the ground for some time before they started their tunnel. Another shift has been put on and will start other workings 300 feet below the present tunnel site.

GILA COUNTY.

There are thirty men at work at the Mallory mine, near Globe, and drifting is being continued both ways at bottom of the 460-foot shaft, one drift west and the other northeast. The former is in 100 feet and shows copper sulphides. They expect to strike the main ore body by July 10, says the Globe Times.

J. Glasson and J. B. Whelan have contracted to deliver to the Black Warrior C. Co. smelter seven tons of iron ore per day from the Glasson mine, 9 miles north of Globe and 2 miles east of the Nugget mill. The Nugget road has been repaired for a length of 4 miles. The Glasson claim is said to show a ledge between lime and diorite, with 10 feet of magnetic iron ore, going 50% iron in excess of silica, and carrying 5% copper, making a desirable flux for smelting the siliceous ores of the district.

Superintendent H. Zschoechner says he has begun development work on the Gladys mine at Dripping Springs, near Globe. This is one of the gold claims on which he has a bond for W. B. Devereux of Colorado Springs, Colo. Two shafts will be sunk to depth of 100 feet and the lead prospected. The first payment of \$5000 on the bond on the Gladys and Cowboy claims was made last week.

GRAHAM COUNTY.

The Shannon C. Co. at Clifton is producing twenty-three tons of copper daily. The smelter consists of two 225-ton furnaces and they have a concentrating plant. The product of the Shannon Co. is a matte which is put through the converter plant of the Arizona C. Co.

The Copper Era reports a consolidation of the holdings of the Clifton Con. C. Co. and the New England C. Co., owning adjoining groups west of the Frisco river, near Clifton. The holdings of the two companies, together with the claims of the Markeen Co., which failed to do its assessment work last year, will total 100 claims, says Manager Dunham of the Clifton Con. Co. A. P. Ayling is manager of the New England Co., which has developed its ore body to a depth of 600 feet.

MOHAVE COUNTY.

(Special Correspondence).—Another 100-foot contract for drifting on the 500 level of the Tennessee mine has been let. The silver discovery made by J. Carroll, near the Juno and Mormon Girl mines, is being developed. Assays show 200 ounces silver. The shoot on the Emerson mine, being worked by S. Smith, in which the ore was struck at a depth of 70 feet, is down 115 feet and shows the shoot an average of 14 inches, with a value of 2½ ounces gold per ton. The owner will put in a gasoline engine and hoist, and sink to

200 feet. The Redemption mine, owned by R. J. Ferguson & Sons, is in shipping ore in a winze that is being sunk in the lower tunnel. Water is coming in and arrangements are being made to put in a pump. Assays of the ores give 12% copper, 45 ounces silver, \$10 gold and some lead. Shipments of this ore are being made ready to send out. The North Star mine reports developing a body of 20 inches of ore, assaying 100 ounces silver and 2 ounces gold. The shaft is down 75 feet. This is on the mountain at the head of Alum wash. The Queen Bee mine at Mineral Park is in silver ore of shipping grade. Since putting up the steam hoist development work has increased. Chloride, June 8.

PIMA COUNTY.

The Del Monte group of copper mines, 35 miles east of Tucson, has been sold to Cananea men for \$250,000, says the Tucson Post, and D. Donovan, former part owner, is retained as superintendent. There are 25,000 tons of ore on the dump ready for the smelter which will be built by the new company. Operations have begun. Connection will be made with the Phoenix & Eastern railroad which is building and will run within 10 miles of the mine.

Twelve men are at work on the mines of the Blue Grass G. & C. M. Co. in the Rincon district, near Tucson, sinking a double-compartment shaft.

PINAL COUNTY.

Oil is reported coming into the well being drilled in the Hackberry wash, near Kelvin, by the Pinal Paraffine Oil Co. Another cable has been put in place and the company are going down to the 2000-foot mark. They are down 1260 feet, says Superintendent Parker.

YAVAPAI COUNTY.

The tunnel on the Crook mine, near Prescott, is in 1000 feet and showing a pay streak of 18 inches of ore, which is said to carry \$42 per ton in gold. The air is getting bad in the tunnel and work is temporarily suspended for that reason. Blowers will be used. This property is being developed by the Pan-American M. Co.

The Bannie G. M. & M Co., near Walker, is taking ore from a 400-foot drift from the 100-foot level. The ore values run \$20 per ton and the ore is a sulphide. The company intends to build a mill to treat the ore on the ground.

The Sparneck custom stamp mill at Kirkland is running steadily. The power used is obtained from Kirkland creek. The stamp mill on the Contention group of mines in the Bradshaw mountains, near Del Pasco, southeast of Prescott, is completed. Ore is being mined in the 665-foot tunnel.

CALIFORNIA.

AMADOR COUNTY.

At the Telegraph Hill mine, operating on Rancheria creek, near Amador City, they have changed their system of work and are sinking a shaft on Mickey Frea gulch, where they expect to tap the gravel channel. The work is being done under the supervision of L. F. Eaton.

BUTTE COUNTY.

Operations at the mines of the Big Butte M. Co. on west branch of Butte creek, 2 miles from Berdan, are progressing. After two years of development work they are piping with one giant, with satisfactory returns. They have 6½ miles of ditch and flume and a 300-foot dam. They propose to enlarge the plant.

CALAVERAS COUNTY.

The work of unwatering the Esperanza mine, near Mokelumne Hill, is progressing and has reached the 900-foot level.

The Lee Hunt mine, near Milton, has been bonded to San Francisco parties, says the Calaveras Prospect, and machinery is being put in. The mine is on the Hunt ranch.—The Morning Star mine in Salt Spring valley, near Milton, is to be developed by G. Tolman.

Superintendent Robinson says machinery will be put in at the Stockton Hill mine, near Mokelumne Hill, and operations will resume.

The shaft of the Madison mine at Angels is being unwatered and connection will be made with the Gold Cliff mine.

Manager Gray of the Shepard gravel mine, near Sheep Ranch, says they are putting in a 6-stamp triplicate discharge mill.

A number of transfers of mining property adjoining the Gwin mine have been made to the Rialto M. Co., including the Good Hope, the North Paloma Extension and Victor mine and millsite. A. Caminetti of Jackson is manager. It is reported that operations will begin this month.

EL DORADO COUNTY.

Superintendent Gould has men at work

at the Excelsior mine on Pacific bill, near Placerville. The tunnel is being cleared out and a blacksmith shop has been built.

A. Harpending is pushing work on his mine on Mathenas creek and is putting up machinery consisting of a hoist, 5-stamp mill and pumps. A shaft will be sunk on the Mathenas creek mine.

The Rosenfelds of San Francisco, owners of the Vandalia mine, are preparing to open a limestone deposit near Bennet station. A kiln will be erected and the product used at the Vandalia mine.

INYO COUNTY.

Near Coso Hot Springs, south of Darwin, a find of a ledge of gold-bearing quartz is reported, which is said to run \$25 per ton. It is stated that water must be pumped from Little Lake, 12 miles distant, in order to work the claim.

KERN COUNTY.

The Monarch Oil Co. is building a 75,000-barrel reservoir in Sunset, which it is proposed to cover.—Last week well No. 4 of the Revenue Oil Co., near Bakersfield, which has been pumped for three years, began flowing at rate of 500 barrels a day and is continuing it.

The business portion of the mining town of Randsburg was destroyed by fire on the 6th inst.

MARIPOSA COUNTY.

The Hayseed mine, near Whitlock, has resumed after being closed down on account of scarcity of fuel. The Farmer's Hope has men at work, under E. B. Walters as superintendent.—C. Czerny has bought the S. John's interests in the Bull Dog mine and expects to work it this summer. A mill test gave returns of \$7 gold per ton.—Hart & Co. have opened a pocket on the Jones mine, giving returns of \$5 to the pan.

MENDOCINO COUNTY.

The Russian River Oil and D. Co. have made a contract by which a well will be sunk to a depth of 1500 feet near Ukiah.

NEVADA COUNTY.

The I. N. Robinson mining and timber properties, 4 miles from Graniteville, have been bonded to L. S. Johnson of Alleghany for an Eastern company. The property consists of the Jim mine, three gravel claims of twenty acres each, and 100 acres of timber land, also water rights on Little Canyon creek. The Jim mine is near the Baltic and is on the ledge that runs across to Diamond creek. The mine will be reopened and a new tunnel run to open the vein. It will be 1400 feet long.

Operations have begun at the Kenton mine on Kanaka creek, near Alleghany, under Superintendent A. Fitzgerald.

Superintendent Kartschoke says he has begun work on a shaft at the end of the south drift of the Delhi mine, near Grass Valley.

The mill of the Gray Eagle mine, near Mayburt, is crushing ore.

The Seven-Thirty mine at Deadman's Flat, near Grass Valley, has been bonded to F. Enzensperger, superintendent of the Red Cross mine, near Washington, and work of reopening the group begun. He intends to put in additional machinery that will be capable of developing the property with depth. Oil may be used as fuel instead of wood.

Negotiations are reported in progress for opening up and working the Cold Spring Blue Gravel mine on Harmony ridge, 2½ miles northeast of Nevada City. The property consists of 410 acres of patented ground, covering the entire gravel channel from rim to rim for a mile. All the ground west of Cold Spring has been worked out.

Operations have resumed this week at the Sunflower mine on Squirrel creek, in Deadman's Flat district near Grass Valley, and the pumps started. Sinking will begin as soon as the mine is drained. Drifts will also be run from each side of the shaft, says Superintendent Ballou.

PLACER COUNTY.

The Chicago mine at Penryn is reported being reopened, with F. Hartley as superintendent. Hoisting machinery and pumps are being put in.

SAN DIEGO COUNTY.

Superintendent R. K. Humphrey of the California Gold King mines at Picacho says 250 men are on the payroll of the company and fifty additional miners will be put to work this month. About half these men are on development work preparatory to an increased output of ore. The leaching plant is being run to full capacity and 350 tons of ore is the daily output of the mine.

SAN MATEO COUNTY.

The Purissima Oil Co. of San Francisco has leased the ranch of T. Johnson, near San Mateo, and will begin sinking wells.

SHASTA COUNTY.

The big dredging plant of the California

& Detroit Dredging Co. (the Heintz dredger) on Clear creek below Horseshoe, near Redding, was totally destroyed by fire on the 3d inst.—loss, \$80,000, reports Manager Heintz. J. R. Hayes of Detroit, Mich., is president of the company.

SIERRA COUNTY.

Superintendent D. R. Smith has begun preparations to reopen the Primrose mine in Hog canyon, near Downville. G. G. Morrison, of Sierra City, is foreman and has men at work.

TUOLUMNE COUNTY.

The new three-compartment shaft being sunk on the Santa Ysabel mine near Stent has reached a depth of 200 feet.

The Boston placer claim, a producer in early days, is being worked by Morris Bros. at Jeffersonville, near Columbia.

The incline shaft on the Dutch mine at Quartz is down 1400 feet. Stopping is in progress on the eighth level.

The Buckeye placer mine, near Jeffersonville, near Columbia, is being reopened under lease. The tunnel, which runs into Table Mountain 1300 feet, is being cleaned out and timbered in places.

The Mazeppa shaft, near Stent, is being repaired and the water pumped out after the temporary shut down.

A 2-stamp mill is crushing rock from the pocket mine dumps of the Smith mine on the Fleming vein, near Jamestown.

Superintendent A. Scott of the Providence mine, on the North Fork of Tuolumne river, near Carters, says he will use a diamond drill to explore their ground. The machine will be electrically driven and have a 300-foot capacity.

A. P. Johnson has bought a one-half interest in the Edna J. mine, located 3 miles east of Sugar Pine.—The owners of the Prudhomme mine, near Carters, have decided to sink a shaft 300 feet. The buckets will be replaced by skips and machine drills used.

A 100 H. P. compressor, a boiler and a 225 H. P. engine have increased the hoisting facilities at the Jumper mine at Stent. Improvements to the mill include two table concentrators, four belt machines and a sand plant. There are 140 men at work.

H. M. Heath of Boston, Mass., manager of the Horse Shoe Bend M. Co.'s mines near Columbia, says they are making preparations to put in machinery. The holdings of the company are on the Tuolumne side of the Stanislaus river, 1½ mile above the Melones and below the Densmore and Riverside mines. He says they own a right to 10,000 inches of the waters of the Stanislaus, and it is intended to begin as soon as the water of the river will permit the erection of a dam at a point already chosen. A ditch is being located and the line cleared. A site for an electric plant and a mill has been selected, and a plant capable of developing 1200 H. P. will be installed. The water rights of Quail gulch and Devil's canyon have also been secured. The company intends erecting a mill capable of treating 500 tons of ore per day, which will use 300 H. P., and the balance will be devoted to mine operation and lighting purposes. E. Goss is superintendent.

J. O. Bouvon has bonded the Black Diamond quartz mine, near the Rawhide mine, near Jamestown.

Work in the shaft of the Sierra mine, near Groveland, is progressing, with three shifts at work, and the 200-foot level is expected to be reached this month. At that point a station will be cut and drifts run on the vein east and west, says President Giles. A mill will be built.

COLORADO.

BOULDER COUNTY.

The Fourth of July tunnel on Arapahoe peak is in 990 feet, and has 800 feet more to go before reaching the copper-bearing dyke which the Con. C. M. & S. Co. owns. Ore has been taken from the Fourth of July shaft, running 10% copper, \$15 gold and 30 ounces silver per ton.—The United States Gold Corporation has 4500 feet on the extension of the Fourth of July and is driving a 5x7 tunnel into Arapahoe which will cut the veins at 200 to 1200 feet depth. They are putting in a compressor plant to be run by water power. The tunnel will be 2000 feet in length.—The Denver Tunnel Co. is working on its Alpha tunnel in Mineral mountain.—Manager Hughes has resumed work on the Rosalind tunnel into Hematite mountain and is making good progress. Indiana and Denver people are interested.—Another shipper has been opened through the Mogul tunnel in Spencer mountain.—Phillips & Shahan, owning the Little Stranger, made a shipment of smelting ore last week.—Lessees Miller & Martin, on the Gold Coin, operating through the Mogul, are breaking ore and have begun shipping. They are operating on a bond and lease.—Operations by the Copper King Free Gold M. Co., at its mines at Dawson City, near Eldora, have been re-

assumed. Their principal values are in copper.

CLEAR CREEK COUNTY.

Nearly all the mines at Idaho Springs have resumed operations, the managers announcing that they would start work on their properties on a basis of eight hours per day, with a minimum wage scale of \$2.75 per day, and make no distinction between union and non-union men.

The work of placing the pipe for supplying water power at the Terrible mine, near Silver Plume, is about completed and the machinery will be set up. The dam that has been built will enable the storage of a large amount of water, so that the machinery can be operated by water power a large portion of the year.

The Commodore M. Co., in which E. E. Reynolds and D. H. Moffat of Denver are interested, is driving its tunnel into Red Elephant mountain at Lawson with two air drills. The tunnel has been driven 420 feet in less than two months and is making 6 feet per day. The distance to the principal lodes of the group is 2000 feet.

A contract has been let by the Indiana G. & S. M. Co. to drive 200 feet of an adit tunnel on their mine at Silver Plume. The tunnel will be driven in on the Indiana vein and it is intended to drive it a total of 500 feet, and also drive crosscuts from the Indiana to other lodes of the group.

The air compressor the Hazelton M. Co. will set up at the Baltimore tunnel, near Silver Plume, is on the ground, says Manager Rogers. The engine chamber, 150 feet from the mouth of the tunnel, has been cleaned out, as it was caved in, but the hoisting engine was found to be damaged. The tunnel is in 700 feet, but the 130 feet having been driven by hand. It is estimated that it will require 1000 feet more of driving to reach the Shively vein, which will be cut 400 feet deeper than the lower workings of that mine which had to be abandoned several years ago on account of the water struck.

Work has been resumed on the Nickel Plate tunnel, near Argentine. It is reported Weaver & Co. have opened up a body of ore in their lease on the Equator mine.

Manager J. R. Elgan has closed a contract for opening up the Lone Tree claims at Freeland and will drive the adit ahead on the Great Western vein to the line of Lone Tree, both being on the same lode. The company will drive the Great Western for 600 feet and then come into the Lone Tree, and will follow it for 2000 feet, opening the known ore bodies at depth of 600 feet below the present workings. The Great Western is owned by the New Era Co., which has granted a right of way through the New Era workings. Machine drills have been at work in the New Era adit for 800 feet and a crosscut of 45 feet has been made to the Great Western vein, which proves to carry 14 inches of smelting ore and 3 feet of concentrating ore, all of which will be treated at the New Era mill. The Teller vein also crosses the Lone Tree, and Manager J. Owen has closed a contract to work the Teller through the Lone Tree workings when that territory is reached. The new workings will develop the Teller 600 feet deeper than the present bottom of the shaft. In the meantime sinking of the Teller will be continued.

CUSTER COUNTY.

Teams are at work hauling machinery and supplies from Rockdale for the Keystone M. Co. at Custer. The Keystone people are operating on Ten-mile hill. There has been more machinery shipped into Custer county during the last six months than the entire year previous, says the Times.

G. W. Avery has a bond and lease on the Dirigo mine at Querida, adjoining the Aburdiz group, and has begun operations.

President S. H. Baker of the Ilse G. M. Co., whose mill buildings and shafthouse were burned to the ground at Ilse, 25 miles southwest of Florence, is drawing up plans for rebuilding. The loss caused by fire is estimated at \$75,000, partially covered by insurance.

To test their own ore and to save the expense of long hauls to smelting points, Lessee Murphy on the Vanderbilt mine, near Rockvale (Fremont county), decided to put up milling apparatus. He will also build a shafthouse and sink a shaft that will admit of hoisting a heavy tonnage. Machinery for the hoist is on the ground.

FREMONT COUNTY.

The Blaney Oil Co. of Florence has been incorporated under Arizona laws. Eighty acres of oil ground is owned by the company near Florence and five wells are to be drilled. L. & E. L. Blaney and C. W. Blaney are officers.—The oil well opened by the Lobocho Oil & Refining Co. on the Lobocho orchard, near Florence, is being drilled deeper.

GILPIN COUNTY.

The Waltham mine has been sold to an English Co., J. H. Gower, of London, England, formerly of Denver, manager, for \$110,000 cash. The property will be operated by the Waltham Mines Co., Ltd., and extensive development work will be done. The Waltham mine has been worked for several years past by lessees, the greatest depth attained being 200 feet. It is near the Saratoga mine, near Russell Gulch. The same company owns the Gower mine in Central City and the Pierce mine near Black Hawk.

LAKE COUNTY.

Colorado Springs men have organized for the development and operation of Lake county placer fields on the Arkansas river, G. T. Warner, M. S. Atkinson and H. R. Penderly incorporating the Arkansas River Placer M. & I. Co.

J. J. Brown, of the Ibox Co., and A. Nichols of Leadville have a lease on 100 acres of mining ground in Big Evans gulch, near Leadville, and have started development work. The group is north of Breese hill.

LAS ANIMAS COUNTY.

Trinidad reports say the production of coal by the Colorado Fuel & Iron Co. for May was 210,327 tons—an increase of 2500 tons over the greatest previous monthly production. The coke output for the same time was 74,033 tons. Total production of all coal mines in the county for May was 366,327 tons, from which it is estimated the total output for 1903 will be over 4,250,000 tons of coal.

MINERAL COUNTY.

Operations were resumed on the Equity M. & I. Co. group, near Amethyst, last week and men put to work driving the crosscut tunnel to cut the veins crossing the claims that are opened up by surface workings farther up the mountain.

SAGUACHE COUNTY.

The Colorado M. Con. Co., operating near Cochotopa, report opening up a vein of ore in the new shaft, 4 feet across and carrying good values in gold. The company last season built a 10 stamp mill, but did not have sufficient ore opened to keep it busy. The company has done considerable development work on the Standard and Sterling lodes on the Cochotopa.—The Rough Rider G. M. Co. has a bond and lease on the Boston lode in Cochotopa district and will begin operations this month. The workings show a vein that carries \$4 per ton in gold.

SUMMIT COUNTY.

It is reported the Bonanza mine, near Kokomo, owned by T. Connors, will resume. The English tunnel, on Fletcher mountain, is also to resume.—The Union Con. group, Gold Hill, will begin operations this month, and continue driving the tunnel. The tunnel is driven half the intended distance. The upper workings show ore running in gold and lead. Buildings have been erected at the mouth of the tunnel for electric power and drills.—The Nettie B. is again in operation. The workings show bodies of lead, iron and zinc sulphide.

The Belle mine, near Montezuma, the last few months has been shipping high-grade silver ore. The Bullion mine of the Pride M. Co. is producing similar ore. The Ohio M. & M. Co., in driving the Ohio tunnel under the Pennsylvania workings, on the same vein, have opened up and are showing in the breast of the tunnel 8 feet of smelting and mill ore. This gives this company 400 feet of proven stoping ground for 1000 feet, says Superintendent R. T. Williams, and machine drills will be put in and the ground opened up. The mill is being overhauled and more concentrating tables added. The ore is lead, silver, gray copper and chalcopryite, quite free from zinc. The Rothschild T. & M. Co., near the western portal of the Atlantic & Pacific (Brick Pomeroy) tunnel, is steadily driving with machines a crosscut to the Rothschild vein. The tunnel is in 2300 feet, and has a vertical depth of 1300 feet.

TELLER COUNTY.

L. L. Aitken of Colorado Springs, of the Moon-Anchor Con. G. M. Co. at Cripple Creek, says the company has decided to sink its three-compartment shaft an additional 250 feet, making a total depth of 1062 feet. The work will be under way by the time the drainage tunnel is completed and will be carried ahead so that by the time the mine is drained the shaft will have been finished to the 1000-foot point, when an exploratory level will be driven out and a search made for the Moon-Anchor ore shoot. The Moon-Anchor lost its main ore shoot in 1898 at a point between the 400 and 500-foot levels and from the latter depth down to the lowest workings no trace of it has yet been found. A depth of 1000 feet is expected to bring the shaft into the granite. F. J. Campbell, manager of the Vindi-

cator Con. G. M. Co. at Cripple Creek, states that the pumping which has been in progress in the 1200-foot level of that mine has drained the mine to that level. The flow of water has been decreasing of late until it is now reduced from 500 to 300 gallons a minute. They are driving the twelfth level north, opening ore all the way. The winze between the tenth and twelfth levels has been finished. The shoot at the point in the tenth level where the winze was started was 38 feet wide of smelting ore. South of the shaft they are sinking a winze from the 800 to the 1000-foot level and are down 100 feet of the way. The production for May was 1200 tons of the usual grade.

The manager's report to the London office of the Stratton's Independence mine at Cripple Creek shows the returns from the mine for the nine months ending March 31, 1903, to be as follows: Total output of shipping ore, 65,415 tons; total gross value, £279,632, or £4 5s 5d per ton of shipping ore; add sundry receipts from dump leases, etc., £5590; total revenue at the mine, £285,222, from which are deducted working expenses £88 25s, freight and treatment £107,659, leaving a surplus of £89,308 over working expenses, or £1 7s 3d per ton of shipping ore. From this surplus the development work and the additions to plant, machinery and buildings, amounting to £30,554 and £1029 respectively, have been provided, leaving a net balance to the credit of the revenue account of £57,725 for the nine months.

The Raaler mine, at Victor, owned by the C. K. & N. Co., as well as the Modoc mine, is to be equipped with washing machines that will cost \$5000.—Work was resumed on the El Paso mine, in Poverty gulch, last week. Pumping has been stopped for the present, as no headway could be made with the water. The water has raised 60 feet above the ninth level, but there is plenty of ore yet blocked out in the upper levels. It will be necessary to put in additional boilers before a successful attempt can be made to rescue the drowned pumps at the 900-foot level.

The Montreal M. & M. Co., operating the Fluorine claim on Copper mountain, near Cripple Creek, is shipping regularly. The value of the porphyry runs \$25 in gold per ton. The shipments are averaging seventy tons a month, and they will be increased this month.—The Globe mill, a cyanide process, has resumed operations after an extended idleness. It will treat only low-grade ores. Its capacity is 100 tons per day. B. Ross of Denver is manager.

The Abe Lincoln mine, in Poverty gulch, is yielding an average of forty tons of ore per day, that runs two ounces to the ton. The ore shoot which was opened in the fifth level south of the shaft, and in Lillie ground, continues, the ore being broken 2 feet in width.

Superintendent W. B. Bainbridge says he expects to have the Cripple Creek drainage tunnel completed between August 20 and September 1. Despite the several delays to which they were subjected during May, the tunnel was driven ahead at the uniform rate of 19 feet a day (but half a foot under schedule time), and from now on it is planned to do better than 20 feet a day.

The Telegraph says it is the intention of President Burns of the Portland M. Co., at Cripple Creek, to have in his employ by Sept. 1st at least 1000 men. The mine is outputting 300 tons of ore per day. The air compressor, capable of handling 110 machine drills, is expected to be in place by July 1st. The battery of boilers is also being increased.

H. C. Oastler, J. E. Pender and W. F. Tomlinson have bought from the Doctor Jack Pot Co. the dump at the mouth of the incline shaft on the Ingham claim, near Cripple Creek. It is intended to put up on the ground a number of tanks and the dump will then be treated by cyanide.—J. R. Barbee and A. Fiddel have a lease on a block of ground on the Maud S. on Tenderfoot hill, owned by the United Mines Co. It is intention of lessees to prospect their territory at surface to determine where to put down a shaft.

While gold values in the 1050-foot level of Stratton's Independence have deteriorated somewhat in recent explorations, south of the main shaft mineral of commercial value has been exposed in bodies of good size in same direction. On 100-foot level a drift on Bobtail has advanced to a point 110 feet south of shaft, where quality was poor, but at 36 feet south on 200-foot level of the Little London a 4-foot body is assaying \$28. Three feet of ore in the north drift of this vein returns \$30. At depth of 500 feet a new south drift in granite shows \$20 ore in a 5-foot shoot.

The Ida May Co., at Cripple Creek, has leased to J. E. Smith blocks 1 and 2, which include the main working shaft, for a period of three years. He is cross-cutting for the extension of the Joe Dandy dyke that extends through the property and into the territory of the

Brigadier claim on which he also had a bond and lease. If he succeeds in opening ore in the dyke he will sink a new shaft through which it will be worked. There are four other sets of lessees working on the ground of the Ida May Co.

IDAHO.

BLAINE COUNTY.

S. M. Smith of Salt Lake City, Utah, reports developments reviving in Greyhound district. Ore was formerly sent out to Ketchum by pack train. On the Bull Dog group of claims, owned by I. Daly and C. Crane, they are driving a crosscut tunnel to cut their main ledge at depth. The vein is 10 feet wide and between granite walls. Openings on the ledge have been made in shallow shafts and in open cuts. Average values show \$20 to the ton, mostly silver and some gold. A showing has been made on the John Henry location, owned by J. Biggs and J. Hays of Boise. They have opened up the ledge showing high-grade ore.

Operations have been temporarily suspended on the 1100-foot level of the Tip-top mine, near Hailey, owing to the influx of water that was tapped.

BOISE COUNTY.

At the Ella Hill mine at Neal, near Boise, being worked by Godbe Bros. of Salt Lake City, Utah, an ore strike has been made. In the tunnel started to open the ledge, when it had been driven 30 feet it cut a 2-foot blind ledge 100 feet from the main ledge. Assays gave returns of \$40 in gold. A drift has been run 40 feet on the ledge and the ore is showing 5 feet wide. The tunnel continues.

J. T. Hodson, manager of the Lincoln Co.'s properties at Pearl, says quite a number of mines and mills in the State using gasoline engines have had to quit business. At the Lincoln he has made arrangements to discontinue the use of gasoline and put in electric power for both mine and mill. A dynamo is on the ground and the wires are being strung from the power plant at Payette.

IDAHO COUNTY.

In Thunder Mountain district W. A. Stevens, manager of the Mines Exploration & Dev. Co. of New York, has bonded the Crown group of six claims on Big creek, near Roosevelt, for \$25,000. The ore body on the claims is said to be 4 feet wide and gives an average assay of \$40.

H. Madgwick, of Lewiston, reports at his South Fork placer mines, in upper Clearwater section, the hydraulic plant is in operation. Madgwick et al. have 250 acres of gold-bearing high bars on the south fork of the Clearwater, 12 miles from Grangeville. This has been developed by cutting 3 miles of ditch, conveying the waters of four small streams to a reservoir, from which it has been piped on the ground.

D. Doyle of Spokane, Wash., manager, reports work progressing on the Monte Carlo group, 1½ miles west of the American Eagle mine, near Elk City. It is a gold proposition. The American Eagle mine is producing regularly.—At the Hogan mine they are putting in twenty more stamps in addition to its equipment of twenty.

Three gold bars, with an assay value of \$4500, were shipped last week—the result of cleanup of thirty days' run of the Crackerjack mill at Buffalo Hump. The Crackerjack has a 5-stamp mill. The company will put in five additional stamps, which are expected to be in place by August 1.

SHOSHONE COUNTY.

L. W. Steedman, manager of the Paragon mine at Murray, says owing to deep snow and high water, the company was delayed resuming work till this week. They are sinking the main shaft, which is down 100 feet. When the 300-foot level is reached, a crosscut will be run to the ledge, a distance of 145 feet.

D. Doyle of Spokane, Wash., manager of the Monte Carlo mines, near Elk City, reports finding a body of asbestos that could be taken out from the surface in commercial quantities, on Oro Fino creek, 16 miles above Oro Fino. The ledge was of white asbestos, 30 feet wide and showed fibers 6 inches long.

Larson & Greenough, who own the Morning mine at Hunter, near Mullan, are shipping 2800 tons of silver-lead concentrates a month, at an estimated profit of \$25,000.

KENTUCKY.

CRITTENDEN COUNTY.

Near Marion, work on the fifty-ton zinc concentrating plant of the Columbia M. Co. is progressing. The Kentucky Fluor Spar Co. separating plant is being operated to its full capacity, and its ground and fluxing products are being used in the steel and glass trades.

The Old Jim mine continues regular shipments of zinc blende and carbonate. There are 500,000 pounds of "jack"

ready for shipment, in addition to the large tonnage of carbonate. Owing to the fact that the blende is ready for shipment after being hand picked, the working costs in this property are low. Steam is to be substituted for gasoline power.

Mining operations are being carried on inside the city limits of Marlon, along what is known locally as the Marlon Break, says the Lead & Zinc News. The Lucille M. Co. are putting in an 8-inch pump on their shaft. A showing of zinc carbonate is being developed on the property of the Reed M. Co.

MISSOURI.

JASPER COUNTY.

Joplin reports say that the sales of the first five months of 1902 averaged 5258 tons per week, while the sales for the same period of 1903 have averaged only 4705. The total sales of zinc to May 30th are 12,156 tons behind the same period of 1902. The unsatisfactory weather has had much to do with the reduced shipments. Like all the Southwest, Joplin has been suffering from heavy rains. The mines around Badger, including the Peacock Valley and Mabel mines, have been overflowed by Spring river. The Badger mine, from which the camp takes its name, had been at work only a few days, lowering the water which had filled the mine during the March flood. It will take thirty days to restore these properties to shippers, says the Lead & Zinc News.

MICHIGAN.

A Calumet dispatch to the New York Commercial estimates the output of Lake Superior copper this year at 200,000,000 pounds. The output for the first four months has been 66,500,000. The Calumet & Hecla will produce about the same as last year. The Quincy will increase its output by 1,000,000 pounds. The Wolverine will show an increase.

BARAGA COUNTY.

It is reported the management of the Michigan has been successful in obtaining the stamp millsite it has been seeking, adjoining the Mass mill at Keweenaw Bay, and that it will ship rock over the Mineral Range road permanently.

HOUGHTON COUNTY.

The management of the Centennial mine, near Calumet, is preparing to move the machine, blacksmith and carpenter shops from the old shafts on the Calumet conglomerate to A shaft on the Kearsarge amygdaloid. The shafthouse at A shaft is to be torn down and will be replaced by a structure capable of storing 2500 tons—enough to run two heads of stamps at the mill for two days. B shaft has been opened from a depth of 1100 feet up to a point below contact between the ledge and the overburden, or 100 feet from the surface. A shaft is down 2600 feet and sinking has resumed. Both are three-compartment shafts. B shaft is not to be holed through at present. The bottom drift runs north 180 feet and south 155 feet. The eighteenth level drift in the last 400 feet run shows good ground. It is approaching the South Kearsarge line. The drift may be cut through in order to give better ventilation to both mines as in the case of the Wolverine and Kearsarge mines farther north.

The May output of the Champion and Baltic mines, near Houghton, passed all previous figures, being: Baltic 668 tons and Champion 691 tons.

The output of the Atlantic mine, near Houghton, for May was 327 tons, 1045 pounds, the greatest month's return in the history of this mine. This shows an increase in the value of Atlantic rock, as there has been no increase in the number of stamps dropping.

KEWEENAW COUNTY.

The management of the Allouez mine at Allouez say they can sink two shafts 1700 feet apart on the Kearsarge lode to depth of 9900 feet. Only the one just started will be sunk at present, but if the lode shows the expected values a second will be sunk 1700 feet to the northeast. The shaft will sink through 1000 feet of barren ground before reaching the lode when the angle of 80° will be changed to the angle of the lode by an easy curve to make easy riding for the skips. The shaft started is close to the extreme southern corner of the property. Surface sites have been bought from the Ahmeek to the east and the Osceola to the south, on which the engine and boiler house will stand. Alongside the permanent three-compartment shaft a temporary pump shaft will be sunk to the ledge in advance, in which the pump will care for the water, thus relieving the men in the working shaft from that trouble. The foundations for the engine house are laid and the timbers framed. The boiler house will be 50x29 feet and 14 feet to the wall plates. The boilers are on the ground. The temporary hoist used will

do until the hoist used at the Centennial "A" shaft where it carried down 2600 feet is set up.

ONTONAGON COUNTY.

The Victoria M. Co. dam, near Victoria, has been well tested by the heavy rains and spring floods this year and also by several million feet of logs sent over it. The race, 50 feet wide at top and 16 feet at bottom and 12 feet deep, is expected to be finished by July 15th. The water power is delivering 5000 H. P. The mill foundations have been begun. The building will be arranged for two heads at start. Underground operations show the lode well mineralized. The shaft reached the nineteenth level last week. The Victoria makes the first shipment of copper to smelters this season—92 barrels, or 50 tons barrel copper, and 10 tons small masses.

MONTANA.

The receipts of gold and silver at the United States Assay office at Helena for May showed \$184,598.14 in gold and \$870.27 in silver—a total of \$185,828.41, as compared with a total of \$153,402.67 for May, 1902. Montana mines sent in \$162,451.59. The following table shows the receipts of the three chief gold-producing counties of the State for 1903 and 1902:

	1903.	1902.
Fergus	\$95,496 39	\$19,082 25
Madison	23,276 20	12,427 99
Lewistown and Clarke...	21,523 24	34,090 26

Fergus county's gain is due to the fact that a number of mills there are working at practically their full capacity, and the gold ores of Fergus county are largely adapted to the cyanide process.

CASCADE COUNTY.

The Gerber mine at Sand Coulee is making preparations to increase its production of coal, for which it finds a market with the Boston & Montana smelters at Great Falls. The management has built a boiler-house at the entrance of the mine and is putting in four 90 H. P. boilers, one 250 H. P. engine, one 12 H. P. engine, one 24-inch compressor, six new drills, six coal cutters and two pumps. They expect to have the plant in operation next week. With this machinery they expect to turn out 700 tons of coal a day.

CHOTEAU COUNTY.

I. Myers, J. T. Morrow and R. Copper of Lewistown, O. P. Chisholm of Bozeman and F. Truchot, J. W. Shields and J. G. Bair of Choteau have filed placer location notices on 2080 acres of iron-bearing lands on the Ralston buttes, 10 miles northwest of Choteau. The ore is magnetic iron and lies in a bed from 2 to 12 feet thick. The properties have been but slightly developed as yet.

FERGUS COUNTY.

Men have begun work on the Surprise group, near the mouth of Spotted Horse canyon, near Lewistown. The Surprise group is under bond to A. P. Pendleton et al. of Chicago, Ill., with W. E. Wilson of Maiden as superintendent.

FLATHEAD COUNTY.

Operations at the Snowshoe mine, near Libby, have resumed, after being idle several months. Last year the company sunk a shaft from the lowest tunnel 350 feet. Little drifting has been done from this shaft, and it is intended to explore the ground both ways from this shaft before doing any more sinking.

MADISON COUNTY.

The Pacific mine, near Virginia City, has twenty-five men on the payroll, and the mill started in last week on a one-shift run, but a night shift will be put on as soon as the warm weather starts more water. Men will be put on also at the Easton.—W. Suidow and P. McGovern, who have a lease on the Mapleton mine at Adobetown, report making a 200-ton shipment last week of ore assaying \$40.

MISSOULA COUNTY.

The Tarbox lead-silver group, 3 miles up Packer creek, near Saltese, says R. Daxon of Wallace, president and manager, has twenty-five men at work. The company has a heavy hoisting plant. The men are sinking the main shaft, now down 300 feet, to the 450-foot level, where a crosscut will be run to the lead 25 feet. Previous to sinking the company was drifting on the lead, both east and west from the 225-foot level. Each drift has been run 200 feet and in concentrating ore.

The Monitor-Richmond group, 5 miles up Silver creek, south of Saltese, report work progressing. The Richmond has been developed by three shafts, each 500 feet apart, and on the ledge, which carries copper-gold running 15% copper and \$15 gold. Drifts have been run on the lead from the 200-foot level. The Monitor group of ten claims, adjoining the Richmond, carries similar ore. Shipments have been made. There is a 14-foot vein

of sulphide ore. At present the groups are held under bond by the Bitter Root C. M. Co., some of the principals being S. S. Secor and L. G. Beebe of Winnebago, Minn., and H. Welch, State Coal Mining Inspector of Montana. Negotiations are pending for building a \$250,000 smelter at Saltese this summer, being backed by those interested in the Monitor-Richmond group. There are enough properties in this district to keep the reduction works supplied. When the works are completed, the Monitor-Richmond Co. will build an aerial tram to the smelter, a distance of 5 miles, getting the ore to the works for 30 cents per ton, while it costs \$3.50 to haul it by wagon.

SILVER BOW COUNTY.

The mines of the Alice M. Co. at Walkerville are to be equipped with a plant to reduce its argentiferous zinc ore and zinc tailings into commercial form, says Manager Quint at Butte. The parties interested are connected with the zinc plant at Park City, Utah.

NEVADA.

LINCOLN COUNTY.

Superintendent A. A. Ross of the Southern Nevada mine at Searchlight reports opening up the lead in a winze in the workings south of the main working shaft. This shaft was sunk a short distance some time ago and then abandoned. Later it was cleaned out and sinking resumed, and at 65 feet they cut a lead going down at 65° which is 4 feet across. On the foot wall is a shoot of rich ore, but the whole ledge will mill \$15 per ton.

At the Duplex mine, at Searchlight, in the crosscut being run from the Searchlight shaft towards the New Year's Gift, Manager F. P. Swindler reports they have found the lead they had been hunting for. The mine and mill have closed down since on account of the labor situation.

Superintendent F. J. Harrington of the Quartette M. Co., at Searchlight, has closed down their mines and mills because the miners went on a strike due to the order posted that nine hours would be required of all employees not affected by the State eight-hour law. But three men were affected. The foremen are running the pumps. The Good Hope mine is also closed.

LYON COUNTY.

F. E. Shaw of San Francisco, Cal., manager of the Excelsior M. Co., and J. R. Mackay, secretary of the Douglas M. & S. Co., are reported as saying that there is a deal on foot whereby the Douglas Co. will take over the property of the Excelsior Co. at Yerington, consisting of mining claims, smelter, pump plant, telephone line, buildings, etc. The Douglas Co. will make a run of ore from their mine at the smelter next week, and if it proves satisfactory the plant is expected to be moved to the Douglas ground, where additions will be made to it and the reduction of ore begun. The gasoline hoist at the Blue-stone has been removed to the Douglas and set up. Sinking will begin next week.

NYE COUNTY.

Shipments of argentiferous galena and carbonate ores continue from the Lynch & O'Meara mines at Lone Mountain, near Tonopah. The company has twenty-three men at work, and the product forwarded to Salt Lake smelters amounts to a carload per month, values running from \$140 per ton. The workings are 100 feet from surface, the ledge varying from 10 inches to 3 feet in width.

Operations at the Rescue mine, at Tonopah, are progressing since the steam hoisting plant has been in operation. The shaft is down 250 feet and will continue to 500 feet before drifting or crosscutting is begun.

The Boston-Tonopah M. Co., at Tonopah, has bought the Broadstreet claim, which joins the Reptile on the east and the Sparrow claim of the Mizpah Extension on the north. At depth of 220 feet the Boston-Tonopah shaft continues in brown porphyry, which was struck at 185 feet after dropping through the blue porphyry struck at the 120-foot level.

The Tonopah-Bouquet M. Co. of San Francisco, of which R. Kern is president, is preparing to begin development work on its ground near the Little Tonopah mine, 1½ mile northwest of Tonopah. The group consists of four claims. A double-compartment shaft will be sunk.

WHITE PINE COUNTY.

The Muncy Creek mines, near Cherry creek, have been incorporated under the name of the Grand Deposit C. M. Co.

W. A. Watson and P. Jackson are building a 5-stamp mill on their Joanna ground in Cocumungo, near Cherry creek. Work will begin next week on building a mill for the Wide West mine at Cherry Creek.

The shaft at the Pilot Knob copper mine at Ely is being sunk from the 500-foot level to the 600-foot.

NEW MEXICO.

GRANT COUNTY.

The Superior Co. of Lordsburg have leased their mines to parties represented by J. J. Bruck of El Paso, one of the stockholders of the company.

OREGON.

BAKER COUNTY.

E. J. Thorp, superintendent of the Blue Bird mine, near Sumpter, says the 6-drill compressor plant is being set up and development work will resume next week. Plans for a reduction plant are being drawn up. The drift has been driven 300 feet on the ledge, which two crosscuts have shown to be 20 feet wide.

J. J. Hennessy, manager of the Gold Bug Grizzly mine, near Sumpter, started men at work last week. They will resume sinking in the shaft, which is down 100 feet, and go to the 300-foot level, cutting stations at each 100 feet and crosscutting to the parallel ledges, drifting both ways. The shaft is between these two veins, which are 70 feet apart. The mine is equipped with machinery, consisting of a hoist capacity for 700 feet, a 26 H. P. engine, a 50 H. P. return tubular boiler, and pumps.

Superintendent McPhee resumed work on the Golden Wizard mine last week. He is drifting on the tunnel level. The shaft had to be temporarily abandoned on account of water. L. O. Miller of Three Rivers, Mich., president of the Golden Wizard Co., says plans are being drawn for the stamp mill to be erected this fall. It is expected to be of 10-stamp capacity to begin with. The three-compartment shaft will be started when the mill is ready for operation.

Reports from the California mine, near Baker City, owned by the Turnagain Arm M. Co. of Minnesota, say the breast of No. 1 tunnel is in \$96 gold ore. Manager Bellman estimates there are 50,000 tons of \$10 ore blocked out in the workings.

Baker City reports say the Weatherby Bonanza G. M. Co., owning the Weatherby Bonanza mine, on south slope of Lookout mountain, near head of Sisley creek, has been reorganized, and B. E. Wright, R. W. Foster and W. W. Gibbs are officers.

MALHEUR COUNTY.

The 20-stamp mill at the Black Eagle mine, near Malheur City, which was closed down owing to lack of fuel, was started up again last week. Ore is mined and milled at the Black Eagle at a total cost of 90 cents per ton, says Manager Meikle, and the ore averages \$350 per ton on the plates. The ore is quarried from a porphyry dyke, broken down through upraises from an adit level into cars and trammed direct into the mill hopper. The manager reports his company will increase the stamp capacity of the Black Eagle to 100.

SOUTH DAKOTA.

LAWRENCE COUNTY.

A consolidation is reported at Deadwood of the Ak-Sar-Ben G. M. Co., the University G. M. & M. Co., Iron Duke M. Co., Bunker Hill M. Co. and Monarch M. & M. Co. Most of these properties are in Lawrence county, but the University Co. has mines in Custer Co. also. A new company is to be organized to absorb the interests of the above companies, and work will be begun this month on a 300-ton cyanide plant. A water right has been acquired in the purchase, which will furnish water sufficient for a 1000-ton plant. Both the Burlington and Northwestern Railroads are to be extended to the millsite.

D. N. Helser, of Denver, Colo., president of the Spearfish M. Co., operating near Spearfish, says the value of the cleanup for May was \$42,000. The Spearfish Co. milled 54,000 tons of ore during the first year of the new mill's operations (concluded last month). It showed the average value of the savings to be \$5.28 in gold to the ton, and that the mill was extracting 80% of the values contained in the ores.

UTAH.

BEAVER COUNTY.

Four electric drills are being operated at the O. K. mine of the Majestic C. Co., near Milford.

The 90-foot smokestack at the Majestic smelter at Milford has been completed and the men are building the trestle approaches to the ore bins and setting up machinery, says Manager W. A. Farish. There is still considerable work to be done before the plant is ready.

P. B. McKeon reports last week locating a bed of sulphur near the hot springs, near Milford. The deposit is a whitish substance, with which pure sulphur is mixed, and there is apparently a large body of it. The deposit will be developed. Developments are progressing at the

Success mine in Beaver Lake district, near Milford, says Manager Lane. They are opening up a 15-foot vein of ore that averages 5% in copper across its entire width, with portions running 14%. A shaft has been started on the ore body.

The Royal Co. Co. will put in five gasoline bolting engines to be used in the development and operation of as many of the company's groups of mining claims near Milford. Three of the machines will be 40 H. P., another will be 60 H. P. and the fifth, for prospecting purposes, will be 15 H. P. Except the last one, they will enable the Royal Co. to operate to depth of 1500 to 2000 feet.

J. Botkin, president and manager of the Old Catawba Co., operating in Beaver Lake district, near Milford, says the company owns three groups, comprising sixteen claims, and they are opening up a showing of copper assaying 12% copper, 7.4 ounces silver and \$3 gold. A working shaft is being sunk on the Copper King group.

CACHE COUNTY.

I. A. Jones, superintendent of the Reeder mine, has a contract at the Amazon mine in Logan canyon, near Logan, to drive the tunnel ahead, says Manager H. C. Hansen. The tunnel is in 225 feet.

GARFIELD COUNTY.

It is reported Kimball & Turner propose to build a stamp mill on their mines in Henry Mountains district, near Hite, during the summer. C. Gibbons of Hanks-ville has bought an interest with them. The ores show \$15 gold per ton.—M. Perky, at the Bromide group, has men at work on a tunnel. Owing to the hardness of the rock, driving has been slow.

IRON COUNTY.

The principal office of the Johnny Co., operating at Stateline, has been removed to Salt Lake City, and Manager Dooley will, in the future, have his headquarters there.

The Blue Jay Extension M. Co. will begin hauling its initial shipment of ore to the Salt Lake smelters, says President F. Sugden at Salt Lake. The vein struck by the main drift contains a streak, measuring 10 inches wide, assays showing values of 706 ounces silver, 33% lead, 54% copper and \$4 gold. Six feet of the width of the vein contains ore of a sufficient grade to ship in the crude. A 35-foot up-ramp has been made, showing the ore to continue. Later the up-ramp will be continued to the surface and a gasoline hoist put in. The ore will be hauled to Lund or Modena for shipment over the Oregon Short Line.

JUAB COUNTY.

The annual report of the Uncle Sam M. Co. at Eureka shows there was marketed during the period from July 14, 1902, to June 1, 1903, 3039 tons of ore, for which the company received \$47,188.26 net. At the conclusion of the regular report, plans for the erection of a mill to concentrate the low-grade ores were submitted by Manager Chipman.

The concentrator at the Tesora mine, near Eureka, is to be removed to the mouth of the Dalton & Lark tunnel at Bingham. The machinery includes three concentrating tables and two vanners.

Ore shipments from Tintic district for month of May reached a total of 632 cars, the principal shippers being: Bullion-Beck, 26 cars; Carisa, 18; Centennial-Eureka, 144; Dragon iron mine, 99; Gemini, 62; Grand Central, 104; Lower Mammoth, 18; Mammoth, 49; May Day, 2; Star Con., 13; Uncle Sam Con., 11; Victor, 30; Yankee Con., 31.

PIUTE COUNTY.

Two cars of iron ore are going out regularly from the Iron mine, near Marysville, says Superintendent F. E. King. The tonnage will be increased as fast as room can be made for more men.

SALT LAKE COUNTY.

(Special Correspondence)—The United States R. & R. Co. of Colorado City, Colo., will build a 300-ton plant near Salt Lake City. Colorado City, Colo., June 8.

Work was begun on the Chicago mine at Bingham last week by the new company, with S. W. Mosby as superintendent.

Managing Director A. F. Holden of the United States M. Co. says the system of automatic feeding at the furnaces in their smelter at Bingham has been taken out and replaced by hand feeding.

The Bingham Bulletin reports a heavy flow of water struck in the Silver Shield lower tunnel, near Bingham, which gives assurance that the upper workings will soon be drained so that sinking can be resumed.—E. Hill has a bond and lease on the Tough Nut claim, at the mouth of Markham gulch, and has started men on development work.

O. A. Palmer, engineer for the Ontario M. Co. at Bingham, says on the 2000-foot level connection has been made with the

ore body, showing values in silver and lead, with but little zinc. The company will build a concentrating mill.

The Utah Copper Co. has incorporated at Colorado Springs, Colo., with R. A. F. Penrose, Jr., C. M. MacNeill, D. C. Jackling, C. L. Tutt and S. Penrose as directors. The principal office of the company will be in Colorado Springs. The company was organized to take over the De Lamar-Wall group of copper mines near Bingham.

All four furnaces of the United States M. Co. smelter at Bingham are again in commission, the machinery having been overhauled. The mine is delivering ore at the smelter at a lower cost than ever before.

SEVIER COUNTY.

At the Sevier mine of the Sevier Con. M., M. & P. Co., in Gold Mountain district near Richfield, Superintendent H. C. Lawrence has work under way on the equipment. Remodeling of the stamp mill and the addition of machinery will precede the building of cyanide and leaching plant. A mill will be built at the Mammoth mine, of which J. Long is manager. The Holland mine, below the Sevier, resumed, and ore is being opened up.

J. M. Billingsley, of Joseph, says at the B. W. & H. another vein has been struck 1200 feet west from the mouth of the lower tunnel, on which most of the development work has been done, and on the J. M. ground. A surface crosscut of 28 feet has been made across the vein and a shaft started. On the surface the ore assays \$2 and the bottom of the shaft last week showed values of \$3.

SUMMIT COUNTY.

Park City reports say the future of the zinc separating plant at Park City, which was destroyed last month by fire, is to depend on the granting of an extension of the contract with the Daly-Judge M. Co. The contract by which they were operating on the zinc contents of the dump at this mine has less than a year to run.

TOOELE COUNTY.

The Denver M. Co. of Salt Lake has incorporated; J. H. Harlick, W. Maddison, officers. The company owns the Denver lode and five other claims in the Willow Springs district.

With 4000 tons of ore in its bins, the stamps at the Mammoth Co.'s mill at Robinson have begun dropping again.

At Clifton, near Ibapah, in Deep Creek district, J. H. Wolcott and W. Carman, owners of the Pole Star group of copper, silver and lead-bearing mines and the Troy, a gold-bearing proposition, report work progressing. On the Pole Star a shaft has been sunk in ore to depth of 200 feet, at which point a full face of ore is exposed, showing an average of 7% copper and \$6 gold per ton. There are two other ledges for which a crosscut will be started, one of them carrying lead and silver ore, with some gold. On the Troy group a shaft has been sunk to depth of 50 feet.

WASHINGTON COUNTY.

The furnace with which the Dixie group of mines, near St. George, is equipped is producing 12,000 pounds of copper bullion daily, says Manager Beveridge.

WASHINGTON.

OKANOGAN COUNTY.

The Agnes M. Co., through Manager E. W. Beidler, has bought ten placer claims on the north fork of Mary Ann creek, in Myers Creek district, near Concanully. The Agnes Co. is placing sluice boxes on the Red Gauntlet claim and will mine out the creek bed along this fork of Mary Ann creek. The Agnes Co. is composed of New York men.

STEVENS COUNTY.

The Washington group of claims, near Hall's Ferry, 18 miles northwest of Bossburg and 4 miles south of the international boundary line, has resumed work. The development consists of open cuts and tunnels aggregating several hundred feet. The open cuts are run along the trend of the ledge and in each one ore has been exposed. There are two adits 100 feet each in length on the vein, each showing silver-lead ore. Concentrates carry lead 47% and silver 29.6 ounces. The Washington group is in the western portion of Pierre Lake district, 2 miles from the Little Giant mine, and is owned by C. Ward of Bossburg, C. Brooks of Marcus, D. I. Donovan of Spokane. It is intended to build a concentrator at the mines to treat the low-grade ore, while the high grade ore will be shipped as mined to the smelter.

A. W. Holland, president of the Yellow Jacket M. Co. of Spokane, says a strike has been made on the Yellow Jacket claim at 80 feet in the tunnel showing 2 feet of smelting ore. The Yellow Jacket mine is owned by Spokane men and is 6 miles from Marcus and 4 miles from Bossburg, being

between the Columbia and Kettle rivers and within 1 mile of the Washington & Great Northern Railroad.

WISCONSIN.

SAUK COUNTY.

Deposits of high-grade iron ore are reported located near North Freedom. Work is being done from a point west of North Freedom to within a few miles of Baraboo, and explorations are to be made in territory east of Baraboo. The principal operator in the iron fields is the Illinois Iron M. Co. of Chicago, Ill. While the work of actual mining has not begun, 4000 tons of ore have been taken from this mine and are on the dump, having been taken from the mine in the work incidental to drifting and crosscutting. The exploration of this ground was made with a diamond drill and the ore deposit was struck at depths ranging from 100 to 300 feet. At present the work is being done on a deposit 100 feet wide, consisting of 40 feet of shipping ore and 60 feet of concentrating ore.

WYOMING.

CARBON COUNTY.

A plant of machinery and electrical apparatus are being installed at the Elk Mountain M. & M. Co. mine on Elk mountain, near Grand Encampment.

At Battle Lake twenty-five more men were taken on at the Ferris-Haggerty copper mine last week; and the output is being increased. It is reported men will be put to work sinking below the tunnel level, and a winze will be sunk to a depth of 500 feet with crosscuts and levels at every 100 feet. It is expected the tramway buckets will begin to carry the ore to the smelter at Grand Encampment next week.

UINTA COUNTY.

The Atlantic & Pacific Oil Co., operating in Spring Valley field, is reported to have struck a flow of oil at a depth of 870 feet.

FOREIGN.

AFRICA.

RHODESIA.

The March output for Charterland is declared by the Rhodesian Chamber of Mines at 19,626 ounces, 5.95 pennyweights, in value £68,651. This shows an increase of 2537 ounces over February, says the South African Miner. The summary of the analysis is as follows:

	Ozs.	Dwts.	Value.
From mill.....	15,208	6.10	\$55,460
From tailings.....	4,263	10.20	12,650
From other sources.	154	9.65	541
Totals.....	19,626	5.95	£68,651

Scarcity of water accounts for the Eagle Vulture's short run. The Geelong crushed 1676 tons of its own ore, while 343 tons were taken from ancient surface dumps, and 1783 tons from valley development dumps. Twelve tons of concentrates from the Beatrice mine produced an assay value of four ounces per ton. Dry crushing rolls, of a 50-stamp battery capacity, are used on the Wanderer mine, which heads the list of tons milled.

TRANSVAAL.

On the North Rand water is abundant, and on Wilgespruit, where the North Rand "A" property is situated, four or five prospecting shafts and a number of pits and trenches have proved the formation to a small depth, says the South African Miner. In No. 1 shaft a 6-foot ore body has been noted and the shaft is down 115 feet. Drives have also been extended to test the country. At surface the shales are interbedded with the ore body and the formation is hard to follow, but the stratification becomes more defined as the formation is opened up in depth. The reef, which shows free gold in places, appears to consist of a ferruginous crystalline quartzite with jaspery enclosures, and interbedded and interlacing shales at surface. The reef exhibits slight breaks in places, but the general conformability of the strata shows the reef to be regular. Good values are obtained from the green quartzose shale foot wall. A little to the north of these beds the Hospital Hill shales occur. North of this the Du Preez series outcrops have been located, and it is assumed that the series continues throughout the range, which runs regularly along the strike of the North Rand "A" reef.

BRITISH COLUMBIA.

J. F. Wardner, managing director of the Cherry Creek G. M. Co., near Vernon, in Yale-Cariboo district, says machinery for the stamp mill is on the ground. Development work is going ahead and a large tonnage of ore is ready for crushing.

Among the mines which are again starting up near Ymir are the Elise and the Empress of India. The Elise has been

handed to N. J. Hawkins for \$50,000. It is proposed to begin shipments this month. The Empress of India has started up under direction of J. W. Ross of Ymir, who has handed it in the interest of a Buffalo, N. Y., company.—Work has been resumed on the Mayhlossom on Quartz creek, owned by J. F. Harbottle and others.—The Atlin M. & M. Co. has begun operations on the Nome, and the first shipment of ore will be made this week.—The last returns from the Ymir mine at Ymir are as follows: Sixty stamps working twenty days crushed 4550 tons of ore, producing 1235 ounces of bullion, valued at \$13,900. Concentrates shipped amounted to 218 tons, valued at \$5750. At the cyanide mill 3050 tons were treated, producing \$2750. The working expenses for the month were \$18,685, and expenditure on capital amount \$3200. Sundry receipts amounted to \$945, being a net profit of \$1460. The manager reports also that during June a saving of expense will be made in consequence of water power becoming available. The ore on the fifth level has improved in value and averages \$10 per ton.

W. Blakemore, consulting engineer of the British Columbia Coal Co., Ltd., reports awarding a contract for building a pack trail to the company's coal locations near Grand Forks, which are to be prospected with a diamond drill plant previous to opening up development work.

The Horseshoe mine on Trout creek, near Ferguson, has been sold to G. W. Stead, manager of the Philadelphia company operating the Lucky Boy and Ethel mines. Developments on the Lucky Boy show the vein which first lay at an angle of 25° has changed up to 45°, with a tendency to approach the vertical. Though only 40 feet from the surface, they are stopping out from a shoot of 7 inches of gray copper running 800 ounces silver to the ton. This shoot in another place has enlarged to 3 feet of mixed galena and gray copper, with iron sulphides, carrying some gold values and averaging 400 ounces silver. The drifts east and west on this body are in ore.

A. Smith, of Kaslo, has a bond on the Gibson group, on the South Fork of Kaslo creek, and has put miners to work opening up the ore body.

CANADA.

NOVA SCOTIA.

The Dominion Coal Co. have at Glace bay another pump put down into Dominion No. 1 mine. Since pumping began the water has been lowered 15 feet. Conditions are said to be favorable for making good headway. The mine was flooded this spring on account of fire, underground.

CHINA.

Shanghai advices to the London Times say the London-China Syndicate has secured from the Mang-Whey provincial authorities a concession to work the copper and other mines in certain districts of Mang-Whey.

MEXICO.

DURANGO.

E. H. Stanley et al. of Detroit, Mich., have bought a group of mines 100 miles from Durango, at a place called Yerba Buena. The group includes the America, Bunker Hill, Mosa and Soheralante, the last named being a continuation of the Mina Grande, from which the owners are shipping high-grade ore.

JALISCO.

At Etzatlán the Candelaria mine is showing the ore body 6 feet wide and assaying five kilos silver and forty grams gold. This property is owned by the San Miguel M. Co. of New York, with F. W. Harrell as manager.—Carral & Kratz are putting in a 20-ton plant for their mine near Etzatlán, which is expected to be running by Sept. 15.

MEXICO.

Cia. El Progreso y Anexas has been organized to operate a group of mines adjoining the Dos Estrellas mine at El Oro. Their holdings include El Progreso, El Polar and La Joya. These properties have been bought for \$176,000, and are equipped with machinery. The main shaft, three compartments timbered throughout, has been sunk to depth of 100 meters under Manager H. C. Sandifer. The organizers are F. J. Fournier, J. R. Azpe, J. C. Mordough, H. C. Sandifer, E. Calvayrac and R. Pardo.

SAN LUIS POTOSI.

The Los Charcos M. Co., the principal stockholders of which are in Monterey, has bought the Oriental mine, near San Luis Potosi. The ores carry silver and copper.

It is reported from San Luis Potosi a railroad 8 miles long is being built by the San Luis Smelter Co. from Molares to the San Pedro mines. New machinery is

being put in at these mines for hoisting and extracting ores.

SONORA.

The Nogales Copper Co. has bought the Cerro Prieto mines and stamp mill near Magdalena for \$600,000. A cyanide plant will be built and development work increased.

The Mexican-American M. & D. Co., operating the San Ricardo mine, 30 miles east of Paza, in Ures district, have put up a 5-stamp mill at the mine. A hoisting plant, engine, pump, etc., will be put in, says J. C. Dickey of Denver, Colo., manager. The old workings have been cleaned out and 900 feet of railway tracks laid for the operation of coal cars through the tunnel and other parts of the mine. L. D. Phillips is mine superintendent. Bodies of free-milling gold ore have been blocked out.

F. J. Toussaint of Milwaukee, Wis., who is operating the Plomosa mine near Huepac, reports machinery on the ground for a reduction plant. It includes a 5 stamp mill, with pans, Cornish rolls, concentrating jigs and tables, and a 36-inch smelting furnace. On the Plomosa, Toussaint has 2000 feet of development work done.

RUSSIA.

LAPLAND.

Stockholm advices report that negotiations are pending which may result in a \$50,000,000 purchase by the United States Steel Corporation of the entire iron mines in Lapland. The present owners of the Lapland mines are stockholders of the company of which G. E. Broms of Stockholm is president.

SPAIN.

London reports say Spain exported during the three months ending March 31 34,923 metric tons of lead (of 2204.6 pounds each), as compared with 34,206 tons for the corresponding period in 1902 and 28,755 tons in 1901.

PERSONAL.

C. O. LAGERFELT of El Paso, Tex., is at Camargo, Chihuahua, Mexico.

S. W. MOSBY is superintendent of the Chicago mine at Bingham, Utah.

C. M. FUELLER of Denver, Colo., is in Deadwood, S. D., on mining business.

H. A. TITCOMB, associated with A. C. Beatty, of Denver, Colo., is in Europe.

F. HARTLEY is superintendent of the Chicago mine at Penryn, Placer county, Cal.

H. J. STEVENS of Houghton, Mich., is visiting mines in Arizona and New Mexico.

N. E. GUYOT is manager of the Custer M. & Realty Co. properties near Custer City, Colo.

H. Z. OSBORNE, U. S. Marshal at Los Angeles, Cal., has gone to Mexico on mining business.

H. N. ELMER, Chicago manager Trenton Iron Co., has returned there from Denver, Colo.

J. D. BASCOM, of Broderick & Bascom Rope Co., St. Louis, Mo., was in Denver, Colo., last week.

J. H. HAMMOND, who has been examining mines at Tonopah, Nev., has gone to New York City.

A. J. McDONELL, a mine superintendent of Virginia City, Nev., is in San Francisco, Cal., on business.

F. C. COOLEY, Western sales agent Baker & Adamson Chemical Co., Easton, Pa., is at Santa Cruz, Cal.

A. BARNABY returned to Bisbee, Ariz., last week from a two weeks' trip into Mexico on mining business.

R. L. LLOYD, until recently of the Boston & Montana smelter at Great Falls, Mont., has gone to Mexico.

H. JOUANEN of Mexico City, interested in mines in Mexico, is spending some time in Denver, Colo., and vicinity.

P. F. CROWLEY of Clifton, Ariz., left last week for Cripple Creek, Colo., and the East as far as Milwaukee, Wis.

J. S. McCULLOUGH is manager of the Standard M. & M. Co., operating at Marysville, Plute county, Utah.

J. A. CRONKHITE returned last week to Chihuahua, Mexico, from a trip to St. Louis, Mo., on mining business.

D. McVICHIE, manager of the Bingham Con. M. Co. of Bingham, Utah, is in the East from Salt Lake City, Utah.

A. C. BELL, contracting engineer of the

Wisconsin Bridge Co., has returned to Denver, Colo., from Clifton, Ariz.

J. BROCK of Philadelphia, Pa., president of the Milpah Extension M. Co., is visiting their mines at Tonopah, Nev.

W. J. DOOLY, manager of the Johnny mine at Stateline, Utah, has moved his headquarters to Salt Lake City, Utah.

T. J. HOOVER, E. M., has been appointed assistant superintendent of the Standard Con. G. M. Co. at Bodie, Cal.

JOHN LAWLER of Prescott, Ariz., and a large mine owner in the Territory, has returned home from San Francisco, Cal.

MANAGING DIRECTOR A. F. HOLDEN of the United States M. Co. of Bingham, Utah, is in the East on company business.

R. S. McCAFFERY is manager of the Grand Deposit group of mines, Muncie creek, near Aurum, White Pine Co., Nev.

G. F. BATCHELDER of Minneapolis, Minn., is in Denver, Colo., looking after his mining interests throughout the State.

G. H. ROBINSON, manager of the Tintic M. & D. Co., returned to Salt Lake City, Utah, last week from British Columbia.

R. B. McCONNEY, engineer with Holt-hoff Machinery Co., Milwaukee, Wis., was in Denver, Colo., the past week on business.

W. H. GRAHAM, interested in mines in Argus Range, near Randsburg, Kern county, Cal., is in Los Angeles, Cal., on business.

R. C. SHAW, general manager of the Thayer M. & M. Co. of Miramar, Costa Rica, C. A., has gone to New York City on business.

R. J. ANDERSON, manager of the G. & S. E. Co. of America, Ltd., Denver, Colo., is in Scotland on business connected with his company.

T. A. ROGERS of Mountain View, Cal., manager of the Mira Monte M. Co., is at Aspen Grove, Similkameen district, British Columbia.

A. M. JENNINGS of Buffalo, N. Y., president of the Southern Nevada M. Co. at Searchlight, Lincoln county, Nev., is at their mines.

SUPERINTENDENT P. J. McGUIGAN of the Alamo M. Co. is in Spokane, Wash., on company business from Alamo, Grant county, Or.

J. W. GRAHAM of Denver, Colo., is president of the Elkton Con. G. M. Co., operating at Cripple Creek, Colo., vice G. Bernard, resigned.

H. C. BOSWORTH, manager Denver Fire Clay Co., Denver, Colo., is on a trip through California, Oregon, Washington and British Columbia.

G. BERNARD of Colorado Springs, Colo., has resigned as president and director of the Elkton Con. G. M. Co., operating at Cripple Creek, Colo.

T. E. SCHWARZ, mining engineer of Denver, Colo., has returned there from a trip to Chihuahua, Mexico, where he was examining mining property.

W. H. BREVOORT, president and general manager of the Greenback mines and mill near Grant's Pass, Josephine county, Or., returned last week from a trip East.

F. BUTLER, former superintendent of the Chainman mine at Ely, Nev., has a similar position with the Utah & Eastern C. Co., near St. George, Washington county, Utah.

E. J. BONSTELL, who has been conducting cyanide experiments on sulphide concentrates at the Mount Jefferson mine, Groveland, Cal., has returned to San Francisco, Cal.

J. H. HUTCHISON, formerly connected with the Trade Dollar mine at Silver City, Idaho, will leave for Alaska this month to examine mining properties for Philadelphia parties.

G. W. MYERS, Pacific coast representative of the Chrome Steel Works of Brooklyn, N. Y., has returned to San Francisco, Cal., from a business trip to Douglas Island and Juneau, Alaska.

H. E. NELSON, for some time past engineer with the American S. & R. Co., has resigned and accepted a position with the United States R. & R. Co., with headquarters in Salt Lake City, Utah.

A. VAN DER NAILLEN, C. E., of San Francisco, Cal., has been decorated by Leopold, King of the Belgians, "Chevalier of the Order of Leopold," in consideration of his distinguished services as an educator.

A. GLASSBROOK, for several years identified with the mines of Aspen, Colo., and until recently with the Park City Metals Co. zinc plant, Park City, Utah, is with

the Mines & Smelter Supply Co. at Salt Lake City, Utah.

J. D. SEITZ AND E. J. STREET of Kansas City, Mo., of the Lucky Tiger M. Co., operating in Sonora, Mex., returned to Kansas City last week from Mexico.

Commercial Paragraphs.

THE Mide & Smelter Supply Co., Denver, Colo., report the sale of twenty Wilfley tables to the Montana Ore Pur. Co., Butte, Mont.; two Wilfley slime tables to the North American Copper Co., Grand Encampment, Wyo.; three Durkee electric drills and gasoline plant to Alaska.

THE Jeannette Iron Works Co. of Jeannette, Pa., manufacturers of mine pumps, report shipping to Mexico through their Denver branch an electric power pump for 1000 feet lift, being the last one of six ordered. They have also shipped to Mexico a compound steam pump for 1600 feet lift.

THE Gardner Electric Drill & Machinery Co., E. C. Means, Western manager, Denver, Colo., report success with their electric drills. They recently received a contract from the Denver, Northwestern & Pacific Ry., Denver, Colo., for twelve of their drills and orders for several more. This is the result of extended tests to demonstrate to the contractors the ability of the Gardner drill to do the work required.

THE Chrome Steel Works of Brooklyn, N. Y., G. W. Myers Pacific coast agent, San Francisco, Cal., report closing a large contract with the Alaska-Treadwell M. Co., Alaska, for chrome steel shoes; also, a contract to equip the Ebner G. M. Co. at Juneau, Alaska, with Canda cams and chrome steel parts for a 100-stamp mill. G. W. Myers reports also equipping the mill of the Bagdad M. & M. Co. at Barstow, Cal., with Canda cams.

TESTS made by C. W. Weiss at the Metz & Weiss engine works, 128-138 Mott street, New York City, with Cuban and Brazilian cheap alcohol as fuel in their standard kerosene engines, have been reported as satisfactory. The object was to substitute alcohol for kerosene, the former being cheaper and more readily obtainable in Cuba and South America, to which places they report many of these engines are being exported. It was found that a mixture of four parts alcohol and two parts water developed 4 H. P. for one hour. The mixture of alcohol varies, however, with the quality of the former, being limited by the practical degree of compression prior to combustion. The specific gravity of the mixture is .9, the pure alcohol was .794. The development of the alcohol engine is of importance to the power question of Cuba, Brazil and the Philippine Islands.

THE Lagonda Mfg. Co. of Springfield, Ohio, reports the month of May to have been the best they have had since they commenced the manufacture of their tube cleaners. The demand for these machines, they say, is growing. They have been crowded out of the factory which they have been occupying for the past year and have built a factory of their own, which is greatly enlarged, and have equipped it throughout with special tools and machinery adapted for the particular work which they have to do; but even in their new quarters, they say, they are compelled to run overtime in order to keep up with the demand made upon them for machines. Boiler cleaning is one of the most difficult jobs the engineer has to perform. It is a source of continual worry to him, as well as a matter of anxiety to the superintendent, as tubes in bad condition not only cut down the power, but add to the fuel bills. In addition to tube cleaners, this company is making feed water and damper regulators and will be pleased to correspond with any interested in anything along these lines.

Obituary.

F. H. BEURICH, for the past seven years superintendent of the Evening Star mine in Old Diggins district, near Redding, Shasta county, Cal., died on the 2d inst. of heart failure. Deceased was a native of Germany, 58 years of age.

D. P. BYSTLE, a pioneer mining man of Shasta county, Cal., died at Redding, Cal., on the 7th inst. Deceased was born in Pennsylvania, September, 1821, coming to California in 1850, and engaged in mining on the Feather river. He is survived by three daughters and two sons.

E. TILLEY, a pioneer mining man of Nevada county, Cal., died at Nevada City,

Cal., June 5. Deceased was a native of England, aged sixty-four years. When eighteen years of age he came to the United States and worked in the copper mines at Lake Superior, Mich., rising to the position of "captain," or superintendent of the mine. Later, going to California, he became superintendent of the Forest Springs mine near Nevada City, then of the North Banner mine, and, still later, superintendent of the Murchie and of the Peabody mines. He is survived by a widow.

C. E. PURRINGTON, a well-known California mine manager, and superintendent of the Fremont consolidated mines near Amador City, Cal., was instantly killed on June 6 by the explosion of the air compressor. The machine had been working unsatisfactorily and Mr. Purrington was endeavoring to fix it when the accident occurred. His foreman, Wales Palmer, was also seriously injured by the explosion. Mr. Purrington had been in charge of the Gover mine several years previous to the consolidation of the property, in which he took an active and important part. He was highly esteemed by those who knew him, and his loss will be keenly felt in Amador county. He leaves a wife and family.

New Patents.

DEWEY, STRONO & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JUNE 2, 1903.

- 730,674.—BICYCLE PUMP—W. A. Allen, Colgate Place, Wash.
- 730,075.—SAFETY SNAP—C. P. Allison, Lodi, Cal.
- 729,992.—LOADING ORB—J. Baker, Jr., S. F.
- 729,718.—CLEANING SAND FILTER BEDS—H. W. Blaisdel, Yuma, Ariz.
- 729,719.—CLEANING SAND FILTER BEDS—H. W. Blaisdel, Yuma, Ariz.
- 729,720.—CLEANING SAND FILTER BEDS—H. W. Blaisdel, Yuma, Ariz.
- 729,721.—CLEANING SAND FILTER BEDS—H. W. Blaisdel, Yuma, Ariz.
- 729,722.—CLEANING SAND FILTER BEDS—H. W. Blaisdel, Yuma, Ariz.
- 730,036.—SAND DRIER—H. W. Bohrmann, Los Angeles, Cal.
- 729,534.—COUPLING—M. P. Boss, S. F.
- 729,734.—SACK SEWING MACHINE—J. L. Boyle, Harrisburg, Or.
- 729,726.—JAR CLOSURE—Annie E. Bray, Los Gatos, Cal.
- 729,728.—PIPE WRENCH—F. D. Bullard, Los Angeles, Cal.
- 729,731.—GLOVE—F. H. Bushy, S. F.
- 729,545.—BARREL TAP—M. J. Chaplin, Seattle, Wash.
- 729,741.—VISE—G. W. Drew, S. F.
- 729,743.—UNDER REAMER—M. H. Dunn, Fullerton, Cal.
- 729,553.—SPEAKING TUBE MOUTHPIECE—Finck & Eberstitt, S. F.
- 729,576.—MOTOR VEHICLE—J. D. Harp, Modesto, Cal.
- 729,931.—ICE VEHICLE—I. N. Hennessy, Ilwaco, Wash.
- 729,870.—PUMP—B. Jackson, S. F.
- 729,139.—RAILWAY SPIKE—J. W. Macauley, San Jose, Cal.
- 729,662.—TUB ATTACHING DEVICE—G. H. Marker, Spokane, Wash.
- 730,141.—PICTURE FRAME HANGER—F. A. Matthews, Eureka, Ca.
- 729,631.—MIRROR RECEPTACLE—J. A. Miller, S. F.
- 729,883.—GRAIN SCREEN—Mood & Lyman, Colfax, Wash.
- 729,890.—HAMMER—G. W. Peek, Greenview, Cal.
- 729,723.—SOUND RECORDER—E. J. Romano, Seattle, Wash.
- 729,903.—BALING PRESS—G. Senger, S. F.
- 730,172.—CHURN—M. F. Still, Lapanza, Cal.
- 730,183.—WINDOW CLEANER—F. W. Wille, Oakland, Cal.
- 730,064.—TROLLING SPOON—A. W. Wilson, S. F.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

SERIES HIGH PRESSURE CENTRIFUGAL PUMPS FOR HIGH HEADS.—No. 729,870. June 2, 1903. Byron Jackson, San Francisco, Cal. This invention relates to improvements in series high-pressure centrifugal pumps for raising and forcing water by increasing pressure in successive steps, using the centrifugal impactive and cumulative forces set up by two or more rotating runners mounted upon the same shaft; and it consists of an improved adjustable automatic balance for end thrust on shafting and of casing sections inclosing suitably curved waterways between the discharge of one runner and the entrance of the next in the series. There are details of construction which provide a simple, practical and operative machine.

BALING PRESS.—No. 729,903. June 2, 1903. G. Senger, San Francisco, Cal. This invention relates to improvements in horizontal presses of the continuous type. Its object is to provide a press of maximum capacity in which there need be no cessation of operations, either for feeding, tying or discharging, in which the operating mechanism for the followers is simple, and in which the same power driving the followers may be utilized to co-operate in propelling the carriage upon which the press may be mounted.

MOUTHPIECES FOR SPEAKING TUBES.—No. 729,853. June 2, 1903. Julius Finck and H. Herstritt, San Francisco, Cal. Assigned to Will & Finck Co. of San Francisco, Cal. a corporation. This invention relates to improvements in call annunciators in which both a visible and audible signal is given. Its object is to provide a device in which a semaphore will be operated, a whistle blown and an electric bell rung by the action in the tube, of the breath of the person giving the call and in which device wind and drafts will be prevented from passing through the tube to operate the signals accidentally, as so frequently happens in factories and large buildings to cause annoyance in answering false alarms.

MINING AND SCIENTIFIC PRESS

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Mining in British Columbia.

British Columbia is notedly a mining region. Its hills are rugged, and many of its mountain ranges are high, and on the whole, the transportation problem, where it has not been simplified by railways, is one which is a serious drawback to the more rapid development of the region. The report of the Minister of Mines for that Province, Hon. E. G. Prior, for the year 1902, states that the progress for that year has been less marked than usual, and states further that if the statistics of production alone be relied upon, it would appear that no advance whatever had

silver, copper, lead and coal showed a falling off of 4% to 58%.

The Province has great fertility of resource, however, and large districts are said to remain still unprospected. With better prices for silver, copper and lead, the present year should show a material improvement in those metals; but the coal mines are still greatly affected by strikes and other troubles. Gold mining in the Province seems to have a steadily increasing growth, and in this commodity, at least, there is no depreciation in the value of the metal produced. In the gold mining industry of the Province placer, hydraulic and quartz mines are operating,

ing of gold-copper ores and \$655,321 from amalgamation and concentration of siliceous ores, the concentrates being smelted. The total amount of silver produced in 1902 was 3,917,917 ounces, valued at \$1,941,328. The total copper production reached 29,636,057 pounds, of which somewhat more than one-half was produced by the Boundary district, and over 11,000,000 pounds by Rossland district.

A small amount of platinum was derived from placer washings, and tin is reported discovered in metallic form in rock in a mine in Cariboo district. This reported occurrence of metallic tin is so unusual that the report should be taken with much allowance,



McClelland Mountain, and Colorado Central Dumps, Near Argentine, Colo. (See Page 396.)

been made, as the gross value of the output is really less than that for the previous year, though this is the first time that this has occurred since the beginning of mining in the Province.

This falling off in value of output is due to a number of causes. British Columbia is a large producer of base metal, copper and lead, and also produces a large amount of silver while producing also a large amount of gold. The fluctuations of the market have undoubtedly affected the output of the base metals, and in the coal mines, the rapid introduction of petroleum as fuel in California, which was the principal market for the coal mined in the Province, has made a notable reduction in output. Labor troubles also contributed in no small degree to keep that industry from expanding as had been anticipated.

The output of placer gold increased about 10%, and that of vein gold showed an increase of 12.4%, but

and dredging is also in progress. On the whole, the progress and development of the gold lode mining industry are most promising, for, as the Minister of Mines truthfully says, the product of lode gold mining in British Columbia has shown the steadiest and most regular increase, and this product is the most valuable which the Province has, and gold is the only product not affected by changes and uncertainties of the market. Gold mining, aside from the various forms of placers, can scarcely be considered as a separate industry in the Province, however, as the gold is usually found associated with other metals, such as copper or silver. A certain percentage is derived from stamp milling, but is mostly from smelting of sulphide ores. The gold production of the Province in 1902 is stated to have been \$4,888,269—an increase over the previous year of \$539,666. Of this amount \$4,232,948 were derived from the smelt-

though it may be found upon investigation to be as stated. Dana cites an instance of a reported find of metallic tin near the headwaters of Clarence river, near Ohan, New South Wales, where it is said to occur in small, grayish-white rounded veins, with platinum, iridosmine, gold, cassiterite and corundum, all likely to occur in granitic dikes, and not, therefore, a surprising association of minerals, excepting as to the native tin, which is most unusual.

In addition to the metal and coal mine output of British Columbia, there are quarries and deposits producing structural materials, including granite, bricks, lime, cement, tiling and drain pipe, fireclay, etc., but the amount of the output is not stated by the Minister of Mines. There are in British Columbia a large number of mining districts widely scattered; but there are mines scattered throughout the entire Province, which are described in the report.

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J. F. HALLORAN.....Publisher

San Francisco, June 20, 1903.

TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
McClelland Mountain and Colorado Central Dumps, Near Argentine, Colo.....	391
La Veta Colorado, Minas Nuevas, Near Parral, Mexico.....	394
Las Cruces Shaft, Veta Colorado, Near Parral, Mexico.....	394
Bridge at Parral, Mexico, 300 Years Old.....	394
Morena Mine at Minas Nuevas, Mexico.....	394
Cathedral on the Plaza, Parral, Mexico.....	395
Street Scene Parral, Mexico.....	395
Vidlar Tunnel, East Argentine, Colo.....	396
Interior Vidlar Tunnel, East Argentine, Colo.....	396
Armstrong Tool Holders.....	397
Garnet Camp and Mill, Pony, Montana.....	398
Entrance Garnet Tunnel, Pony, Montana.....	398
Mining and Metallurgical Patents.....	399
EDITORIAL:	
Mining in British Columbia.....	377
Record Shaft Sinking.....	392
Tests on Crude California Petroleum.....	393
The Miner and the Law.....	392
Ventilation in Mines.....	392
MINING SUMMARY.....	400-401-402-403
LATEST MARKET REPORTS.....	404
MISCELLANEOUS:	
Concentrates.....	398
Notes in the Parral District, Chihuahua, Mexico.....	394
Record Shaft Sinking.....	395
Electrolytic Reduction of Baryta.....	395
Geological Work in Cripple Creek District of Colorado.....	396
An Important Colorado Enterprise.....	396
Tin in Texas.....	396
The Armstrong Tool Holders.....	397
Gold Ores of Ontario, Canada.....	397
A Montana Gold Mine.....	398
The Production of Arsenic.....	398
Regeneration of Cyanide Solutions.....	398
Mining and Metallurgical Patents.....	399
Personal.....	404
Commercial Paragraphs.....	404
Books Received.....	404
Obituary.....	404
New Patents.....	404
Notices of Recent Patents.....	404

Record Shaft Sinking.

The figures given in a communication appearing elsewhere herein, relative to the progress of shaft sinking in the shafts of the Nigel Deep mine, on the Rand in South Africa, are worthy of attention, as illustrating what has been accomplished in that remarkable country. When shafts are put down at the rate of 3 to 5 feet per day in the United States, the accomplishment is viewed with satisfaction, but when the result of the work of November last in sinking the shaft of the Wolhuter mine was announced—209 feet in a single month—it out-reached by considerable the most speedy shaft sinking in hard rock, in this country and on the Rand as well, but the statement that 260 feet were sunk in a vertical shaft, and a similar amount in an inclined shaft on the Nigel Deep in July, 1898, and the further statement that had not a defective hoisting machine retarded work, a record of 300 feet would have been possible, is remarkable, and the more so in consideration of the large amount of ground being broken elsewhere in the mine and hoisted through the same shaft. While the "unfavorable conditions" mentioned might have had an influence on the work that was and may have been accomplished, the handicap was probably confined to the afore-mentioned hoist and all other conditions, as to hardness and character of ground, freedom from troublesome water, etc., must have been of the most favorable sort.

THE Navy Department has concluded a long series of exhaustive tests on crude California petroleum as fuel for naval vessels. It is stated that as a result of these tests, which have been conducted on vessels on the Potomac river, that petroleum is superior to coal, and will be introduced on coast defense and torpedo boats, but on the larger vessels coal will still be used.

The Miner and the Law.

In the case of J. J. O'Leary vs. J. Ross, Judge Stewart of the District court, in Washington county, Idaho, has rendered a decision in favor of the defendant. The disputed point involved the validity of defendant's location, because of non-agreement between the monuments as set on the ground and the description of the claim boundaries as given in the recorded location certificate. Subsequent to the Ross location, O'Leary staked a claim guided by the recorded boundaries of the prior location, but overlapping it as staked on the ground. It is a recognized rule in law that, where there is a variation between the "metes and bounds," as recorded, and the monuments in place, the monuments control. The average miner and prospector is not presumed to be an expert surveyor, so mistakes as to directions and distances may naturally be expected to occur, which fact the law recognizes, hence the decision.

The United States statutes is the fundamental basis upon which the prospector and miner relies in locating his mineral claim. The statutes are less complete and clear in some of their details than may be desired. This is evidenced in the conflicting opinions of recognized legal authorities, and in the numerous suits at law over questions which should be perfectly plain. The various mining States of the West have added to rather than detracted from the perplexities which beset the prospector by wholesale (and sometimes unnecessary) mining legislation. Certain laws, or parts of laws, proving obnoxious, have from time to time been repealed, or amended, thus complicating a situation already bad, until the miner scarcely knows what his rights really are or what the law expects of him. No State or local laws supplementing the United States statutes are really necessary; but where such do exist a location may be perfected by following the requirements of the Federal law and also those of the local law. A State or local mining district may not make laws in conflict with the Federal statutes, but they may impose additional conditions, and in some States this is actually done.

While, in a general way, the locator would be safe in following exactly the requirements of the United States law, in some States failure to comply with the local or State law might result in forfeiture of a claim. For this reason the prospector should be familiar with all the mining laws—Federal, State and local—in the district in which he is working.

In the single matter of marking boundaries, as an instance, there is considerable diversity as to requirements in the several States. In this matter the element of time is an important consideration. In some States the law is made perfectly plain, and no misunderstanding should occur; while in others the "letter of the law" does not make it wholly clear what time may elapse between the "discovery" and "marking the boundaries." Yet in no case is a location perfected until the boundaries are indicated by suitable monuments.

The Arizona law requires that within ninety days of the date of discovery the locator shall establish his boundaries by "setting six substantial posts, projecting at least 4 feet above the surface of the ground, or by substantial stone monuments at least 3 feet high, to wit, one at each corner of said claim and one at the center of each end line thereof."

In California there is no definite requirement and the Federal statute must be relied upon. Under the United States law a claim may be marked at any time prior to the acquisition of an intervening right, regardless of whether the time within which such marking was made was reasonable or not. It has been held in California that while a party in actual possession, proceeding with diligence to mark his boundaries, would be protected as against a stranger attempting to relocate, yet strictly speaking, no time is allowed the locator to complete his location by marking it on the surface. As it is a physical impossibility for a locator unaided to erect the several monuments, or posts which define the boundaries of his claim at the same moment, he must have some time in which to perform this necessary act, and in consideration of this common sense idea the Circuit Court of Appeals for the ninth circuit, in one of the California cases (Newbill vs. Thurston, 65 Cal.), de-

clined to accept this doctrine of the California courts (Doe vs. Waterloo M. Co., Fed. 70), but followed the rule announced by the Supreme Courts of Idaho and Nevada, and the very evident intent of the law as suggested by the Supreme Court of the United States, and the courts of last resort in Colorado, South Dakota, Washington and Montana. The Court of Appeals has held that after a discovery and posting a notice thereof the locator had a reasonable time in which to complete his location; what was a reasonable time would be determined by the facts in each case, and that evidence of customs in other localities might be received for the purpose of determination, and that under the circumstances in that particular case that twenty days was a reasonable time.

The State laws of Colorado do not define the time within which a location may be perfected, which leaves the locator to rely upon the Federal law. Nevada, North Dakota, South Dakota, Utah, Wyoming and Washington are similarly situated in this regard.

In Idaho the State law provides that within ten days from the date of making a discovery the locator must mark his boundaries "by establishing at each corner thereof, and at any angle in the side lines, a monument marked with the name of the claim and the angle it represents."

The Montana law requires that within thirty days of discovery the locator shall mark his boundaries, and Oregon gives a similar length of time.

In view of this perplexing situation, it is to the interest of the locator that he shall perfect his location as speedily as possible, but in many cases the strike and extent of the ore deposit or vein are obscure and can only be determined by actual development, and on the whole the courts are inclined to deal leniently with the locator who fails to hastily erect monuments defining his claim. In the event of a rich discovery a locator should fix his stakes as quickly as practicable, but if the error is made in laying out the claim across the lode instead of along its course, whereby the vein crosses the side lines, he loses his extralateral right, and this every miner desires to secure.

Ventilation in Mines.

One of the most important matters for the consideration of a mine manager is the ventilation of the workings. It is true some mines are far superior to others in this regard, due to many causes. A mine having large shafts or tunnels, with roomy drifts, etc., is naturally better ventilated than where the workings are small. A mine heavily timbered generates more foul air (CO₂) than one where little or no timber is employed, particularly where the air is humid. There are many ways in which mine air becomes contaminated. The breathing of the workers; the burning of lights (other than electric); the oxidation (rotting) of timbers; all consume oxygen and produce carbon dioxide. Beside these noxious gases, floating dust, smoke and other foreign bodies in the atmosphere help to contaminate the air the miner must breathe. An abnormally high temperature is also prejudicial to the health of the miner, particularly when there is much moisture present.

Mines which are naturally ventilated, by reason of connection with the surface at several points, as in a mine opened by a tunnel which is connected with the surface with a raise, or workings connected with the surface by two or more shafts. Artificial ventilation is provided by means of fans, blowers, water blasts, etc., and where large volumes of compressed air are employed this also assists ventilation, though in the case of the latter the air is sometimes vitiated by lubricating oil and is often rendered unfit for breathing, by reason of the oil being heated to high temperature in the cylinders of the compressor and adjacent pipes. So hot does the air become at times that the highly heated oil has been known to ignite spontaneously, creating a volume of smoke and carbonic acid gas which is forced into the mine workings. There are many different methods of ventilating mines, and where the ventilation is not naturally good it should be rendered as good as possible by mechanical means. It is not economy to fail to provide good air for miners to breathe, for in order to accomplish a satisfactory shift work, the air must be free from foul gas and other contaminating substances.

CONCENTRATES.

A BELT traveling 3500 feet per minute will require a tension of but 9½ pounds for each inch in width in order to transmit 1 H. P., and one having a width of $100 \div 9.5 = 10.5$ inches, will transmit 100 H. P.

A DUPLEX double-acting mine pump, plungers 10 inches diameter, stroke 24 inches, forty revolutions per minute, would discharge 555 gallons per minute.

THE mineral specimens from Fernwood, Idaho, are a variety of garnet, with small scales of copper carbonate (malachite). Garnet is of frequent occurrence with copper ore, particularly when in or near limestone.

COMMON iron castings may be coppered by dipping the absolutely clean castings into a solution of 1½ pound copper sulphate in water to which one ounce sulphuric acid has been added, the articles so coppered being subsequently washed and dried.

QUARTZITES in some of the old crystalline rocks are sometimes mineral-bearing; particularly do they often contain iron and copper ores. The jasper often found accompanying quartzites is due to the metamorphism of such fine grained rocks as slate.

FROM 60 to 70 cubic feet free air per minute are required to operate a 2½-inch drill, sixty pounds gauge pressure, at sea level, atmospheric pressure being 14.7 pounds per square inch. At 3000 feet altitude atmospheric pressure is 13.16 pounds per square inch, requiring proportionate increase.

THE mineral sample from Riddle, Oregon, is magnetite (magnetic iron oxide). The rock accompanying it is not serpentine, but seems to be a basic dike rock which is partly altered to serpentine. The green scales and stains are copper carbonate. The fibrous olive green mineral is crysolite—a variety of serpentine.

CAST IRON articles such as car wheels, for instance, are made by casting the article in an iron mould instead of a sand mould. The depth of "chill" depends to some extent upon the size of the casting, the chill on a small casting being relatively deeper than in a large one. Unless very small, the inner portion is not chilled by the process.

A STRIP of single belting, 1 inch wide and 13 feet long, weighs, approximately, one pound, and a similar strip of double belting, 8 feet long, also weighs a pound; so that the weight of a belt may be estimated by multiplying the width in inches by length in feet, and dividing the product by 13 for single and 8 for double belts; the quotient will be the weight in pounds.

ALUMINUM, because of possessing the property of forming under whetting action a very fine mass to which steel strongly adheres, is being used for manufacture of whetstones. A steel blade sharpened on aluminum, when examined by microscope at 1000 diameters, shows the cutting edge perfectly uniform and unbroken—not serrated, as steel whetted on stone.

QUICKSILVER, or mercury, occurs in the native state in veins and deposits containing the ores of this metal. The most common ore of quicksilver is cinnabar (HgS), mercury sulphide. The occurrence of native mercury in an ore deposit of cinnabar is looked upon with distrust by some miners, who consider it an indication that the bottom of the deposit is not far distant.

THE Colorado "bumping table" is run at varying speed and length of vibration, depending upon the character of ore treated. It is usually run at 160 bumps per minute with 1½-inch stroke. Often it is run at 150 bumps, with 1½-inch stroke, and sometimes at 180 bumps with 1-inch stroke. The more rapid the bumps the shorter the length of stroke, and vice versa.

WHENEVER electricity is used in connection with cyaniding there is a larger expenditure of chemicals, and the base metals are dissolved to a much greater extent along with the gold and silver, which for later separation involves increased expense. However, when electric current is employed, a weaker cyanide solution may be employed, as its action is increased by the current.

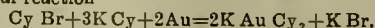
APLITE is a fine-grained granite dike rock, usually composed of quartz, orthoclase and some plagioclase, generally without mica, or with a very small amount of silver-white mica or greenish potash mica. Often the rock is very siliceous, the silica evidently being the result of infiltration, and when in this condition is occasionally gold bearing. Often it graduates into felsite on one hand and into normal granite on the other.

THE practice of placing a shut-off valve on the main line leading from an air compressor to the receiver, usually situated outside the building, is one which should be discontinued, though, fortunately, not in general use. A valve so located may have its sphere of usefulness, but it is difficult to discover just what it is. It is doubtful if a

valve placed in the position indicated would pay for its cost and installation. A valve beyond the receiver is recommended, and it can often be employed to advantage.

A WATER WHEEL may be given increase of speed from that which the water imparts to it, by means of a motor, and may thus give increased power, but the full amount of power so transmitted by the wheel will not equal the normal amount afforded by the motor and the water. The amount of power so available from the wheel will be but slightly in advance of that derivable by the wheel from either the motor or the water separately.

THE SULMAN-TEED process, which is that of treating ores by a solution of bromo-cyanide, is based on the chemical reaction



It is claimed that the superiority of this process over the ordinary cyanide process lies in the fact that the addition of bromine to the solution renders the dissolving power of the cyanide more effective and rapid. It is claimed also that the addition of peroxide of barium to cyanide solutions greatly accelerates the action of the cyanide.

CONCERNING mining claims in the forest reserves, the proclamations themselves provide specially for preserving the status of mining claims which are valid and subsisting at the date of the withdrawing of the land from that portion of the public domain subject to appropriation. It is not, and never has been, the policy or intention of the Government to antagonize the mineral industry in the withdrawal of the forest-bearing lands from settlement, but to protect the forests from destructive fires and other waste, that it might be used in mining and other legitimate industries.

In steam pumps five ports are employed—two for admitting steam only, two for exhausting steam only, and the fifth, or central port, the same as in the engine. It is necessary to cushion the piston in direct-acting pumps, so that when high speeds are reached the piston at one end and the plungers at the opposite end will not strike the cylinder heads. The cushioning effect is secured by providing a separate exhaust port, so located that when the piston has nearly completed the stroke it will close the exhaust port and entrap a portion of the exhaust steam. This steam is confined between the piston and the cylinder head, and being prevented from escaping through the steam port by the valve, it is compressed, and thus stops the piston before it reaches the cylinder head.

STADIA HAIRS can be placed in instruments which are without them. This should be done by instrument makers who have every facility for this class of work. Fixed hairs are usually more satisfactory than those susceptible to adjustment, as there is less danger of the lines becoming disarranged. The hairs are generally placed at such a distance from each other as to cover exactly 1 foot on the stadia rod, when the latter is set exactly 100 feet from the focal distance of the instrument. Each foot read on the stadia rod indicates a distance of 100 feet, to which must be added the constant distance from the center of the instrument to the focal point in front of the object glass, this distance being usually 10 to 14 inches, depending on the size of the instrument.

THE origin of a mountain range cannot well be given in a "Concentrate." Briefly, the earth was once incandescent, is still very hot within and cooling very slowly. Where sediments accumulate on a sea bottom the interior heat rises, the thicker the sediment the higher the degree there of interior heat. This temperature in the presence of the included water of the sediments ultimately produces softening or fusion of the sediments and of the sea floor on which they rest. This establishes a line of weakness, and, hence, a line of yielding, crushing, bulging, folding—a mountain range, which means a subsidence and a pushing and folding upward. Of course in all this, a million of what we call "years," is but a tick of Nature's clock. Nature knows nothing of "Time," past or present. It has but one eternal "Now."

TOURMALINE CRYSTALS of good size and perfect form are a much sought for article among mineral collectors. California has produced some beautiful tourmaline crystals. The very finest specimens are secured in Eastern localities—Connecticut, Maine and Virginia. Tourmaline comes in colors—black, blue black, brown, yellow green and gray. A fine red tourmaline is such a rarity that it commands an enormous price, as much as \$500 having been paid for a single specimen. Such a specimen must be perfectly transparent and free from flaws. The prismatic faces of tourmalines are strongly striated, vertically, and the crystals are hence often much rounded and barrel-shaped. The mineral is strongly dichroic—that is, exhibits different colors when viewed in a different direction. It becomes electric by friction, usually found in coarse-grained granite dikes.

A GOOD method of testing the strength of cyanide solutions is by means of titration with nitrate of silver solution. This method is based on the fact that silver cyanide is soluble in an excess of potassium cyanide, with the formation of a double cyanide of silver and potas-

sium. At a certain point, however, in the addition of the silver nitrate, the silver cyanide ceases to be dissolved and falls as a whitish precipitate. The amount of silver nitrate (of standard solution) required to cause an incipient precipitation to take place, measured on a burette, determines the percentage of cyanide present in the solution. A standard solution may be made by dissolving 13.06 grains of pure silver nitrate (AgNO₃) in one liter of distilled water. The addition of each 0.1 c.c. of this solution to 10 c.c. of cyanide solution to be tested represents 0.01% of pure cyanide of potassium in the solution.

THE process of recovering gold from cyanide solutions by passing the solutions through a charcoal filter was invented and patented by Dr. W. D. Johnstone in 1894. The process is not in use except experimentally. Charcoal was previously employed in recovering gold from chlorure solutions containing it. This process was employed at the large chlorination works at the Mount Morgan mine, Queensland, Australia, and is still in use there. When a large amount of gold has been deposited on the charcoal filter, the coal is removed, dried and incinerated in a furnace constructed for the purpose. In the use of charcoal in the cyanide process, it is said that particles of the coal in extremely fine state of division pass the filter, and reaching the sump tanks are pumped back to the solution tanks and ultimately into the percolation vats, where it causes precipitation of the dissolved gold.

THE ROCK SAMPLES sent from Yale, B. C., are quartzite containing scales of graphite, constituting what may be termed a graphitic schist. Neither pyrite nor chalcocopyrite are observed in the several samples, though the brown stains are undoubtedly due to iron oxide. This may be due to the oxidation of a small amount of iron sulphide, which may occur in finely disseminated grains. The iridescence noticed on some of the pieces of rock may be due to copper, but it is probable copper will be found to occur, if at all, in very small amount. The rock may be gold bearing, as such rock sometimes is, but there would probably be found some difficulty in amalgamating such ore. Concentration, however, would probably give a better result. Graphite is sometimes separated from gangue in which it occurs by concentration. In some instances the rock is finely pulverized in water, the graphite floating being recovered from the surface of the waters.

THE Federal statutes provide that failure to perform \$100 worth of work, or to make \$100 worth of improvements during any one year following the first January after date of location, renders such mine or claim subject to relocation by another, no matter what amount of work may have been previously performed or improvements made. A new discovery is not an essential basis for a new location. Under the law discovery and appropriation are recognized as the sources of title to mining claims, and development by working as the condition of continued ownership until patent is obtained. If the vein discovered by a former locator extends through the claim and is elsewhere exposed, this is sufficient upon which to base a new location. A relocation is made in substantially the same manner as the original. A relocater may adopt the stakes and monuments of the former locator if he so desires. The laws of California do not require any particular form of location notice, and a witness to the location or relocation of a mining claim, though admittedly of value to the locator, is entirely unnecessary. Moreover, in the absence of State legislation or local law, the Federal laws do not even require a location notice to be posted.

ASSAYS made from the cuttings of diamond drill bits are necessarily only approximately indicative of the values through which the drill passes. When in operation the diamond drill cuts an annular space in the rock, the central portion being known as the core. As the drill advances, the fine material resulting from the scratching of the diamonds sets in the bit, is driven backward by water which is introduced under pressure, the cuttings flowing out of the drill hole, where, if desirable, they are allowed to fall into a receptacle of some sort. Ordinarily this is a bucket, and the cuttings flow for some time into the bucket, often overflowing and the slimes passing out with the water would destroy the value of the sample, if it were a sample, but unfortunately it is not. The particles of rock, sulphides of the base metals, gold or whatever substance may be contained in the rock through which the drill passes, pass backward through the bore hole. Often along the bore hole the surface is rough, particularly in schistose or slaty rocks, and any particles of high specific gravity will settle in the depressions for a time, though eventually reaching the outer end of the bore. When samples are taken by means of the bucket only general knowledge can be gained. The cores, however, furnish absolutely reliable data upon which to base calculations, but it must be understood that only a series of bore holes, systematically placed, will give a definite idea of the size of an ore body or vein. That the cuttings do not fairly represent the ground through which the drill is passing is shown by the fact that when a zone of rock containing abundant sulphide mineral is cut by a diamond drill, and this is succeeded by a zone containing no sulphide, the sulphide previously out continues to be discharged from the bore for some time after the barren zone has been entered, accompanying the cuttings from the latter zone.

Notes in the Parral District, Chihuahua, Mexico.

Written for the MINING AND MINING PRESS by H. Z. OSBORNE,
Los Angeles, Cal.

Parral, or Hidalgo de Parral, is a busy little city of between 15,000 and 20,000 inhabitants, in the southern end of the State of Chihuahua, and the center of one of the most productive mining sections of the republic of Mexico which the writer visited last winter. The city is essentially Mexican in its architectural character and citizenship, and in the entire district there are probably less than 1000 foreigners, of whom the Americans are the most numerous. Parral is built immediately about some of the oldest mines—the hill on which they are situated, called Cerro de la Cruz, or Hill of the Cross, being partly in the city (see illustration). In fact, it was these mines that first brought the village into existence 300 years ago, and some of them have been worked with occasional interruptions until the present day. The Jesus Maria is one of these, and it is

of low freight and smelter charges, that their own works were generally closed, and nearly all the ore was being shipped to the big smelters. Another element in these low smelter charges was undoubtedly the operations of the "independent" smelters, particularly that at Torreon. So great has been the competition between the "trust" smelters—those of the American Smelting & Refining Co. and the Guggenheims—and the independent smelters, that, whereas a few years ago the freight and smelter charges on ore shipped from Parral was \$20 per ton gold, it is now \$12 per ton Mexican, or less than \$5 per ton gold. This brings into market not only the ore that is produced from day to day, but also an enormous quantity of second-grade ore which has been accumulating on the dumps for a century or more, and which could never before be handled at a profit. The shipping output of the Parral mines is now from 40,000 to 50,000 tons per month, and it would be greater if the Mexican Central Railway could furnish the ore cars with which to remove it.

The principal productive mines of the Veta Colorado are at the southern end of the lode, which extends nearly north and south for a distance of 7 or 8

siderable water. It produces from 1000 to 2000 tons per month.

La Alfarena is down about the same depth as La Presena, and the levels between the two mines are connected. Both are owned by the Hidalgo Mining Co., a Pittsburg, Pa., corporation, which operates more and larger mines in the Parral district than any other company. James I. Long, who is also the American Consul, and his brother, Robert J. Long, are the managers of the Hidalgo Mining Co., which also owns and operates the Parral & Durango Railroad.

The Quehradillas adjoins the Veta Grande on the north, and has a shaft 850 feet deep. While this mine has been operated intermittently for a century, its greatest production has been during the past six years, in which a profit of more than \$1,500,000 Mexican has been realized.

Los Muertos is next north of the Quehradillas, and is down 725 feet. It has a fine ore body and produces 2500 tons per month.

The Terrenates is north of Los Muertos, has a shaft 460 feet deep, and is reported to have recently developed a rich ore body.



La Veta Colorado, Minas Nuevas, Near Parral, Mexico.



Las Cruces Shaft, Veta Colorado, Near Parral, Mexico.



Bridge at Parral, Mexico, 300 Years Old.



Morena Mine at Minas Nuevas, Mexico.

credited with a production of \$7,500,000 in silver, with a little gold. The vein is said to average 16 feet in width, and to have been worked to a depth of 250 feet. The Prieta is the most conspicuous mine on the hill, and while it has been worked a great length of time it has attained a depth of but 377 feet.

The most productive mines of the Parral district, however, are not immediately in town. The Veta Colorado, or Red Vein, is north of Parral, and extends in a northerly direction several miles. This is one of the great veins of the world, although it lacks the remarkable length of the mother lode of California, or that of the reefs of the Witwatersrand of South Africa. In fact, the known mines are confined to a length of 3 or 4 miles on the vein, but they are continuous, one after another. The red color of the vein, which is in porphyry, can be seen for a long distance, stretching along the west side of the summit of a range of hills from 500 to 800 feet high. The product of the mines is almost exclusively silver, with a little galena, in quartz. The large percentage of silver in the ores, associated as it is with some lime and iron, makes them particularly desirable for fluxing the baser silver-lead ores of other Mexican districts. To such an extent is this the fact, that, notwithstanding several companies have large reduction works at their mines, the big smelters were offering such inducements to the miners in the way

miles. The best mines cover a length of 2½ miles on the lode, and embrace, from south going north, La Esperanza, La Morena, El Nopal, El Salto, La Presena, Alfarena, El Verde, Veta Grande, Quehradillas, Los Muertos and Terrenates. The lode is owned for miles north of the Terrenates, but less work has been done in these mines, and less values produced. The vein is very wide at the surface, from 50 to 300 feet, but the vein is by no means all ore. The ore occurs in successive shoots, from 100 to 200 feet long and from 1 foot to 60 feet wide, generally largest near the center of the shoot, and the shoots are usually several hundred feet in depth. In La Presena a large lens of ore, carrying 120 ounces silver, was found 40 feet outside the hanging wall of the vein proper, between the 400-level and the surface.

The oldest mine on the lode is the Veta Grande, discovered in 1645, and worked almost continuously ever since. The Veta Grande and El Verde have always been worked as one property, and were recently purchased by the Guggenheims. The main shaft is down 1000 feet on the incline of 52°. All the shafts on the lode are inclines, and all are sunk at about the same angle.

La Morena is 900 feet deep, with no water, and with a fine body of ore, from 10 to 15 feet wide, on the lower level.

La Presena is down 927 feet and is pumping con-

Enough has been said to show the importance of the great Veta Colorado. Parral has many mines, however, and some of them very valuable, that are not on the Veta Colorado. El Refugio is one of these. This mine is at Minas Nuevas, on two veins parallel to the Veta Colorado, but 600 feet west of it. The shaft is down 700 feet. The principal vein is nearly vertical. It was from 1 to 5 feet wide in the upper levels, and from 15 to 20 feet wide in the lower levels of from 70 to 100 ounces silver ore. Extensive reduction works have been constructed on the property, for treatment of ores by the lixiviation process. Nearby, the Hidalgo Mining Co. have two large mills, employing the same process.

Much has been printed about the Palmilla mine, or rather about its owner, Pedro Alvarado, the "peon millionaire," as he is called. Alvarado, who has become very wealthy the past few years from the output of the Palmilla, is credited with having made an offer to President Diaz to pay the Mexican national debt. While Alvarado has made a large amount of money, it is doubtful whether he ever made the offer credited to him, and it is certain that he could not have "made good," if such an offer had been accepted. Neither was Alvarado really a peon. The Palmilla mine was owned by his father before him, but had never been an excessively rich property, although it is one of the historical mines of the Par-

ra's district. Pedro was working it in a limited way in 1900, and encountered a fabulously rich ore body, from which he has taken a handsome fortune. There are no reduction works on the mine, and all the ore is shipped to the smelters. Gold predominates in the product, although there is some silver. Pedro Alvarado, with his sudden wealth, has developed a



Cathedral on the Plaza, Parral, Mexico.

large vein of benevolence, though it usually takes a rather eccentric course. He is constructing a palace on the site of his birthplace, in one of the most squalid parts of the city of Parral. It is all of stone, which admits of most elaborate carving, which is all being done by native workmen. He has also restored a large Catholic church that was going into decay, at a cost of \$80,000. Alvarado is good to the poor, and is said to provide for all the heggars in Parral. The Palmilla mine produces much rich specimen ore, and Mexican miners, like those of some other nationalities, are given to stealing stuff of that sort that



Street Scene, Parral, Mexico; Cerro de la Cruz in Background.

seems to be in their way. Alvarado, however, will not permit any precautions to be taken to prevent thieving, upon the theory, probably, that "it is wrong to muzzle the ox that treads the corn." Altogether, Pedro Alvarado is an interesting character, and many stories are told of his eccentric benevolence. He is also said to have an amiable side toward Americans. His mine has been and still is a large producer of high-grade ore, but bonanza ore is less plentiful than it was a year or two ago.

The San Juanico, owned by the Long brothers, is another rich gold mine with an ancient history. This mine is about 4 or 5 miles northerly from Parral, and a mile east of the Palmilla. It was worked by the "ancients" down to the water level, about 200 feet, and great values are said to have been taken from it. It remained idle for more than half a century, when

the Long brothers purchased it, and equipped it with modern machinery, including a powerful pump and hoist. There are four parallel veins, all within a width of less than 100 feet, varying in width from 3 to 15 feet. The ore is high grade, averaging 2 ounces gold and from 20 to 50 ounces silver per ton. Since my visit to the San Juanico, I am informed that the vein was crosscut at a depth of 300 feet, and 7 feet in width of bonanza ore was found, that would average several hundred dollars per ton.

There are scores of mines at Parral and in its neighborhood well worthy of mention, and several reduction works. The Parral Milling Co. has two mills, one employing the lixiviation process and one concentrating. F. Stallforth Hermanos y Cia have a large patio reduction works.

Santa Barbara, about 12 miles southwest of Parral, is another very productive district, although its ores are not of high grade. This place was, more than three centuries ago, the capital of the Province of Nueva Viscaya, which included the present States and Territories of Chihuahua, Sonora, Coahuila, Texas, New Mexico, Arizona and California. The first mineral discovered in northern Mexico was the gold ore of this place, in the year 1547. The branch of the Mexican Central Railroad, which leaves the main line at Jimenez and passes through Parral, is extended to Santa Barbara. The Guggenheim Exploration Co. operate the celebrated Tecolotes mine at Santa Barbara, and have a concentrating mill of 400 tons daily capacity. The Montezuma Lead Co.'s concentrating mill is of 375 tons capacity. The San Francisco del Oro and the Parral Mine, Ltd., also have reduction works at Santa Barbara.

A company, of which Thomas Lane, of California, is the head, has concessions for and has in operation electric light and telephone systems in Parral, Minas Nuevas and Santa Barbara, and has a concession for a water system.

The Hidalgo Mining Co. have built a narrow-gauge railroad—the Parral y Durango—out from Parral about 80 kilometers into a fine body of timber, of which they own about 200,000 acres. This road passes through Minas Nuevas, and several smaller mining camps, and an interesting agricultural country. It furnishes Parral and its various power plants with fuel and lumber, and is a profitable piece of property. It is on this road that one starts out for the long mulehack trip to the Guadalupe y Calvo country, in southwestern Chihuahua.

Record Shaft Sinking.

TO THE EDITOR:—In your issue of March 14, 1903, referring to an article entitled "Deep Mining on the Rand," I note the following reference to maximum speed in shaft sinking on the Witwatersrand field: "Should a shaft be started this year to reach the reef at the bottom of the borehole in the Cinderella, allowing no loss of time in preparatory work, and sinking at the maximum speed thus far made on the Rand (Wolhuter 209 feet in the month of November, 1902). * *

I wish to point out that this is an entirely erroneous statement in so far as maximum speed is concerned.

During the month of July, 1898, at the Nigel Deep G. M. Co.'s property, Witwatersrand, a footage of 260 feet was made in what is termed D shaft, this under adverse circumstances, for had not the spur wheel of the hauling engine broken, thus delaying the work considerably, it would have been possible to have accomplished no less than 300 feet during the month.

This sinking was accomplished in an incline shaft 14 feet by 7 feet in the clear, which was being extended from the bottom of the vertical shaft 800 feet in depth. The incline shaft was extended from the 1127-foot level to the 1387-foot level.

In addition to handling the ground broken in the shaft no less than five levels were at the same time being extended from the incline, in each of which an average footage of 100 feet per month was being accomplished, making a total of ten drive faces, in addition to the numerous winzes and rises which were being extended. I refer to these latter faces because the breaking of the ground is really a secondary consideration with the labor and appliances at hand on the Witwatersrand fields, the important consideration in rapid work being the handling of the broken ground.

In driving at the same mine an average monthly footage of 183 feet (over a period of seven months) was accomplished in a single drive, i. e. (7 feet by 5 feet). As far as I know both of these footages are records which have not yet been approached, either on the Witwatersrand field or in this country.

I would be glad if you would publish the above letter, for if nothing more is accomplished it will at least show what can and has been done in the matter of shaft sinking and driving.

At the time this work was being carried out E. H. Garthwaite was the general manager of the property and the writer was the underground superintendent. F. C. ROBERTS, Consulting Engineer.

Bulawayo, Rhodesia, April 10.

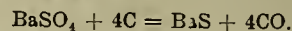
The regular meeting of the Montana Society of Engineers was held in Butte, Mont., on Saturday, the 13th inst.

Electrolytic Reduction of Baryta.

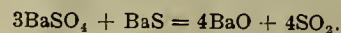
The recent purchase of lands in Washington county, Mo., from which considerable baryta has been mined in the past, and the inauguration of active mining operations in that field by the United Barium Co. of New York City, has attracted considerable attention to the baryta producing possibilities of Missouri, says the St. Louis, Mo., Lead and Zinc News. In 1901 the total production of baryta in Missouri was slightly in excess of 32,000 tons, of which quantity Washington county produced some 21,000 tons. The total production of baryta in the United States during 1901 was 49,070 tons, from which it will be seen that Washington county, Mo., alone produced 45% of the total output.

The advent of a competitor to the American Lead & Baryta Co. and the baryta combine effected last year makes information regarding the latest addition to the baryta market interesting. The United Barium Co. was formed to acquire the work and the process of working barium sulphate into other barium salts which was developed to commercial working by the Ampere Electro-Chemical Co. The officers of the company are: G. S. Ettla, president; W. H. Miller, vice-president; J. G. Petrekin, treasurer, and T. L. Wells, works superintendent.

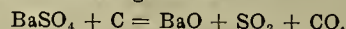
The principle employed is that of melting in an electric furnace a mixture of barium sulphate with a small quantity of carbon, usually only $\frac{1}{10}$ of its weight. If sufficient carbon is present all the sulphate is reduced in the electric furnace to sulphide, according to the reaction



Requiring one part of carbon to five parts of sulphate and reproducing the ordinary furnace reaction for making the sulphide. If barium sulphate and barium sulphide are fused together at the heat of an electric furnace, however, they will react according to the formula



But this reaction cannot be produced at ordinary furnace heats. If, therefore, just one-fourth as much carbon is used as is necessary to reduce the sulphate to sulphide the one-fourth of the sulphate reduced to sulphide reacts upon the unchanged three-fourths and the oxide is obtained. The sum total of the two reactions written altogether is



The reaction is not perfect, however, and in general only about two-thirds of the sulphate is converted into oxide. Nearly one-third remains as sulphide and only a very small fraction remains unchanged, some 1% to 3%.

There are two furnaces now in operation working this process. They are of the direct heating arch type, the carbons being adjustable and playing an arch on to the fused material. The body of the furnace is lined with carbon blocks and the contents are tapped out from time to time, as the furnace gets full of melted material. The carbons are raised and lowered by means of small electric motors, controlled by the workmen, and passed through a square opening in a grid of wrought iron pipes, cooled by a stream of water and covered with a non-conducting cover. The workmen can thus feed in material while standing close to the furnace, but the mixture of barium sulphate and carbon must be fed in slowly, because the gases evolved by the reaction are large in volume and would cause violent boiling if melted too quickly. Attempts are being made to recover the sulphur dioxide evolved so as to convert it into sulphuric acid. Each ton of sulphate furnace gives off enough of this gas to make one-half a ton of 50% sulphuric acid.

The plant is being enlarged so as to manufacture sixty tons of barium hydrate $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$, per day. The present output is stated to be twelve tons daily. There are three 400 H. P. furnaces, each taking 2500 amperes at 120 volts, and at this output, allowing that only 60% of the sulphate is reduced to oxide, the efficiency of the furnaces would count up 74%, absorbed in heating up the melting mixture and in the chemical reaction, while 26% would be lost by radiation.

The furnace product is tapped out, running into cakes about 3 feet by 4 feet and 3 inches thick. This is broken up and digested with hot water, leaving very little insoluble sulphate, but the material is about 60% barium oxide and 40% barium sulphide, which go into a solution as 60 parts hydrated oxide, 20 parts sulphide and 20 parts sulphhydrate. On cooling the filtrate the hydrate, $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$, crystallizes out. When dried and packed it sells at 3 cents per pound. The mother liquors are treated to recover their barium as carbonate and also to recover the sulphur in them by methods which are yet not quite worked out.

The raw material, barite, from Missouri, costs \$2.50 per ton where found, but the railway freight raises its cost to some \$6 per ton at Niagara. It is about 90% pure. To obtain cheap material the company have acquired a remarkable deposit of barite on the north shore of Lake Superior, near Silver Islet. The cliff here is 50 feet high, and a vein of

pure white barite 77 feet wide, with perpendicular strike, is exposed for the whole height of the cliff, and is visible 30 feet down in the water, while it has been traced on shore a distance of 600 feet back from the water. At a moderate calculation 250,000 tons of barite are in sight, which can be shipped from the spot to the company's wharf at Niagara more cheaply than Lake Superior iron ore can be carried to Pittsburgh.

The use of the company's products are various. Barium hydrate finds application in the paint trade in making white paint; in the sugar trade for recovering sugar (as insoluble barium saccharate); from waste dilute solutions and for softening boiler waters. The mother liquors from the crystallization of hydrate, containing barium sulphide and sulphhydrate, have been found useful in removing hair from hide, a solution diluted to 2½% removing all the hair from a hide in three and one-half hours' immersion without any injury to the leather. The same solution is very suitable for making the white paint called lithopone, which is made by running a solution of zinc sulphate into barium sulphide solution, thus producing the precipitated pigment, a mixture of barium sulphate and zinc sulphide. The mother liquors can also be converted into barium carbonate, which has found application in the cyanide industry and also in the manufacture of bricks, for mixed in small proportion with clay it is said to prevent red brick from turning white and white brick from turning green.

Geological Work in Cripple Creek District of Colorado.

In the early history of Cripple Creek the United States Geological Survey made an exhaustive survey of the Cripple Creek, Colo., mining district, and published the same in the sixteenth annual report. That work proved to be of great assistance to the mine operators of the district, but as the workings at that time were comparatively superficial the extensive and deeper operations of recent years made a re-survey of the district advisable, but as the United States Survey was unable to undertake and complete such a survey with the funds available for the purpose, various mining companies and mine owners have contributed the sum necessary to meet the deficiency and the work of the re-survey will be commenced in a short time. Cripple Creek will be represented by J. W. Finch, State Geologist of Colorado. The terms and conditions under which the work is to be conducted is in the form of an agreement and is as follows:

1. The specific work to be undertaken under this agreement is the re-survey of the Cripple Creek mining district, an area of not less than the 38 miles represented on the Cripple Creek special sheet accompanying the Pike's Peak folio No. 7, Geologic Atlas of the United States.

2. The work shall consist in a thorough re-examination of the surface and underground geology as exhibited by natural and artificial surface exposures, mines, drainage tunnels, etc.; a study of the ore deposits as to their distribution, extent, origin and geologic associations; and the preparation of a report accompanied by maps and other illustrations showing the results of this re-examination in detail, to be published by the United Geological Survey without cost to the State.

3. The work shall be in charge of W. Lindgren, geologist, under the direction of the director of the United States Geological Survey through the geologist in charge of economic geology. Mr. Lindgren shall have the selection and entire control of his assistants.

4. During the progress of the work Mr. Lindgren will be intrusted to confer freely with J. W. Finch, State Geologist, and keep him informed of the manner in which the work is being done and of the progress being made. No information of an economic character shall be given out by the State Geologist, Mr. Lindgren, or his assistants, in advance of publication by the survey.

5. For the expense of the work the United States Geological Survey has allotted the sum of \$3500, and the State Geologist of Colorado has allotted an equal amount from funds under his control, the same being now on deposit and subject to his order. During the progress of the work duplicate vouchers will be made out by Mr. Lindgren for all expenses, including salaries of himself and assistants, traveling expenses and field subsistence. These vouchers will be transmitted to the accounting division of the United States Geological Survey, and after approval vouchers covering one-half of the expenditure will be transmitted to the State Geologist of Colorado for payment. A statement of all expenditures for this work will be made monthly by the accounting officers of the United States Geological Survey to the State Geologist.

6. The resulting maps and reports shall fully recognize the State co-operation.

(Signed) J. W. FINCH, State Geologist.
C. D. WALCOTT, Director U. S. Geological Survey

INADVERTENTLY the name of H. S. Johnson, the writer of the illustrated article entitled "Chain and Pick Coal-Cutting Machinery," which appeared in the issue of June 5, was omitted from the same.

An Important Colorado Enterprise.

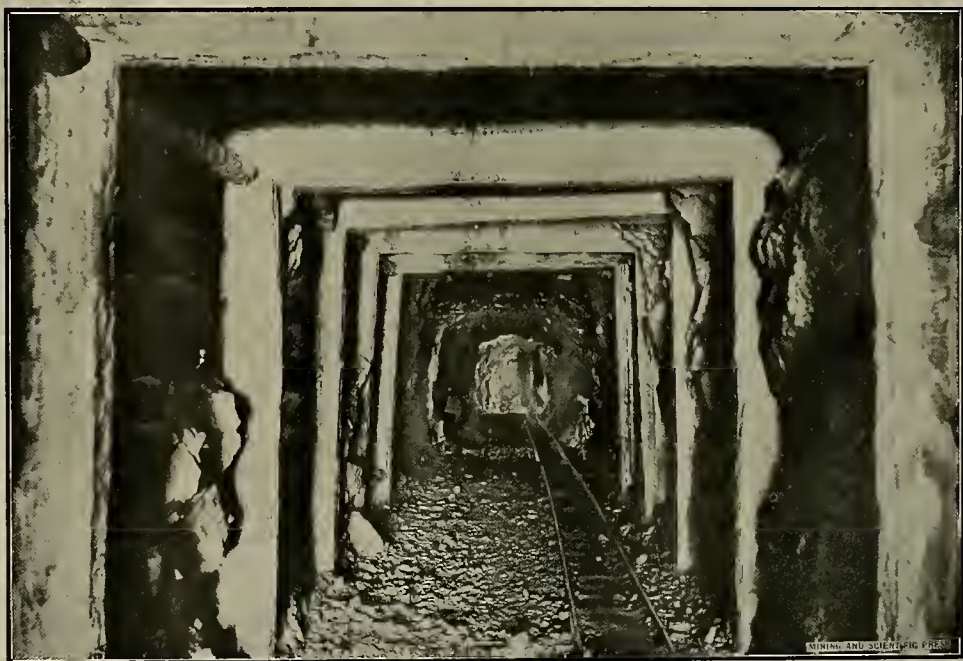
The Transcontinental Transportation & Mining Co., recently organized in Denver, Colo., with a capital of \$3,000,000, promises to be one of the great enterprises of Colorado. This company owns eighty-three mineral claims, 160 acres of placer, three millsites adjoining each other and three tunnel sites, connected, making a total of over 550 acres. The property is situated about 7½ miles above Georgetown, Clear Creek county, in the Argentine mining district. It is the object of the company to drive a tunnel through the Continental Divide. Argentine pass, said to be the highest wagon road in the United States (13,000 feet) winds its way over the property

side of the Divide. The engraving of McClelland mountain (see front page) will give one an idea of the topography of the mountains in the Argentine district, as well as Leavenworth gulch, and the Colorado Central mine, which has produced \$10,000,000 and is still a good producer. The Transcontinental T. & M. Co. also own timber lands and controls the source of Clear creek for a distance of 6000 feet, and has already constructed a good-sized dam, which will furnish all the necessary power for the machinery which will be installed the coming summer. English and German capital is interested in the enterprise, which will mean much to Georgetown and the district generally.

The company is a Colorado corporation, with W. A. L. Cooper as president, R. C. Vidler vice-president



Vidler Tunnel, East Argentine, Colorado.



Interior Vidler Tunnel, East Argentine, Colorado.

of the company, and it is under this pass the company purpose driving a tunnel. The tunnel which has already been started, and now in 350 feet, is known as the Vidler tunnel, and when completed will have a length of 7000 feet, and will cut the entire mineral belt of the district and will enable the company to work its entire system through one main channel. Besides using the tunnel in mining operations it is the intention of the company to use it for railroad purposes, as it will have a size of 16x16 feet, thus enabling the railroad company to complete its line from Georgetown, in Clear Creek county, to Keystone in Summit county, on the other side of the range. This, it is believed, will be valuable, as it will make a shorter route from Denver to Leadville and Salt Lake City. One of the accompanying illustrations is that of the tunnel entrance, and the other the underground workings of the tunnel on the Clear Creek county

and general manager, G. H. McCauliffe secretary, W. A. Deuel and L. F. Kimball directors, and J. F. Brandes, mining engineer of Denver, who has made a study of Clear Creek county mines, is the consulting engineer for the company.

Tin in Texas.

In Bulletin 213 of the United States Geological Survey, W. H. Weed describes the tin deposits at El Paso, which lie on the east flank of the Franklin mountains, about 10 miles north of El Paso. The ores consist of cassiterite, or oxide of tin, with wolframite (tungstate of iron and manganese), in a gangue of quartz. Three veins have been discovered, all of which have been exposed by open-cut work and by pits, for a distance of several hundred feet. The

veins of good ore exhibit the usual characteristics of the European tin veins.

The development seems to show the disappearance of the ore at a depth greater than 50 feet, but it is believed that the veins may be found lower down by crosscutting from the bottom of the present workings.

The Armstrong Tool Holders.

Points of merit claimed for the Armstrong tool holders, manufactured by Armstrong Bros. Tool Co., of 617 Austin Ave., Chicago, Ill., are that tempering is dispensed with; grinding reduced to a minimum; points may be ground to any desired shape or clearance, they are of handy length, and the point always keeps the same height; simple and durable; the rake

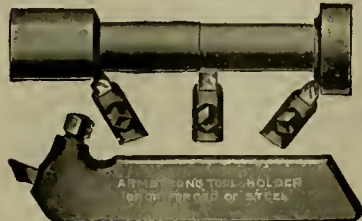


FIG. 1.

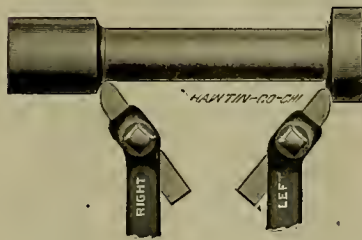


FIG. 4.

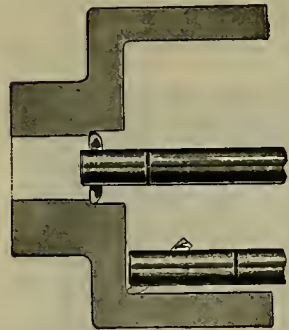


FIG. 8.

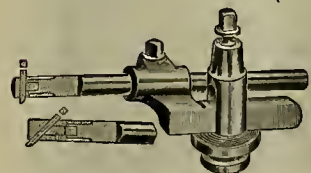


FIG. 11.

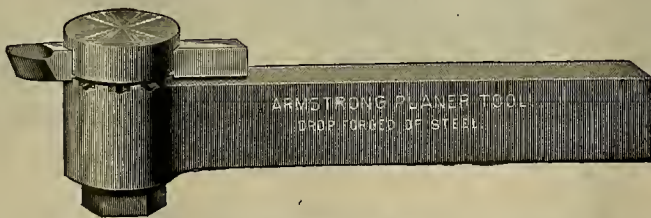


FIG. 14.



FIG. 2.



FIG. 5.

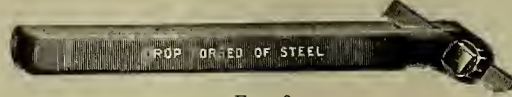


FIG. 6.



FIG. 7.

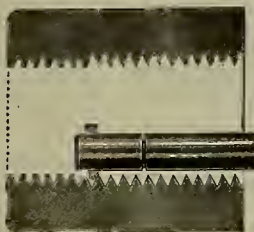


FIG. 9.



FIG. 10.

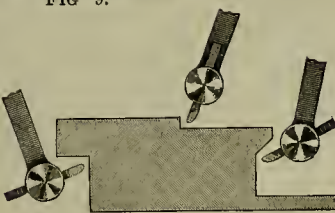


FIG. 12.

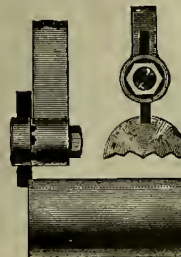


FIG. 13.

Gold Ores of Ontario, Canada.*

NUMBER II—CONCLUDED.

Written by CHARLES BRENT, M. E.

As may be gathered from the foregoing notes, the gold ores of the district may be regarded as free milling, and experience has shown that 70% to 90% of the total gold contents of the ores may be obtained by simple battery amalgamation, and a satisfactory percentage of the remaining values may be obtained by subsequent concentration and chlorination or cyaniding, or by direct cyaniding without previous concentration.

The free milling character of the ore has been retained in depth, and from the considerations pre-

veins in Eagle Lake, is invariably associated with the sulphides of zinc and lead, although these minerals in most cases carry little or no gold per se.

The rare sulphide of bismuth (bismuthinite) is abundant in the ore from the Mikado vein and is sparingly found in other veins of the vicinity. It is invariably associated with high gold values in the Mikado vein, and possesses no significance in any other veins in which it occurs.

Mispickel and other arsenical and antimonial sulphides are rare, and traces only of telluride are met with, the only exception being the Huronian vein in Moss township, which produced very fine specimens of sylvanite, and in the Gold Creek vein on Lake of the Woods, which in a narrow pay shoot carries the rare silver telluride hessite.

Leaves of native copper are comparatively common in the gold ores of the district and particles of native silver and of native platinum have been found associated with gold in several veins on the Lake of the Woods. Molybdenite is commonly found in gold-bearing veins, but possesses no significance as an indicative mineral.

As indicative minerals the sulphides range in value as follows: Zinc blende 1, galena 2, copper pyrites 3, iron pyrites 4.

The Triggs, Reliance, Gold Panner, Virginia, Cameron Island are among many others worked on bedded veins in schistose formations with more or less success.

So-called true fissure veins are numerous in the granite areas, but, as might be expected, are comparatively rare in schist. The Ferguson, Foley and Lucky Coon on the Seine river, the Golden Eagle on Eagle lake, and the Nino in the Deer lake country, may be cited as notable examples of this class of deposit in granite, and the pebble vein at the Gold Hill mine and the jubilee vein on the Manitou may be cited as examples of true fissures in schistose formations.

Of contact veins, no typical examples have been worked, although many such are known. The Mikado vein and the Black Eagle each cross a contact between diabase and granite, and since by longitudinal faulting in each case one wall of the vein is granite and the other diabase for a short distance, these veins are in part true contact deposits.

It may be noted as a curious feature that the richest ore in the Mikado vein lies in the zone of contact, while the leanest ore in the Black Eagle lies in the corresponding position.

As to the primary source of the gold in these deposits, not enough data are at hand to enable one to generalize with any degree of certainty, but from the fact that many of the felsite dykes carry gold per se, and that no gold has been found in Couchiching series and but rarely in the sedimentary members of the Keewatin, and that eruptive contacts have been proven to be favorable to the presence of gold, it would seem that the gold came up from deep-seated sources both with Huronian eruptions and the later Laurentian granites, to be distributed in its present situations with the quartz and accompanying minerals by the circulation of water under unknown conditions as to time, temperature and pressure.

As to the character of the ore, it may be noted that in all classes of deposits the gold, whenever found in workable amounts, is invariably associated with quartz in some form, and with the sulphides of iron, copper, lead and zinc, and that no complex minerals, and but few rare minerals are present.

Gold, if present in workable amounts, is to a great extent, "free milling" and it may be taken as an axiom in this district that if any ore does not show gold in the pan it is economically valueless.

As to associated minerals, it may be noted that iron pyrites occurs in every gold ore in the district, and that as an indicative mineral, it is valueless.

The same is true of pyrrhotite, which is commonly abundant in the pyritous schists. When an ore contains "free" gold the iron pyrite invariably contains gold, the pyrrhotite almost never.

Copper pyrites in the ores of the Black Jack, Wendigo, Mikado and Black Eagle is invariably associated with high values in gold, while in the ores of most of the other veins of the district its presence means nothing favorable or otherwise.

True fahl bands or belts of schist impregnated with pyrite and other sulphides are unknown in the district, but numerous bands of pyritous schist with intercalated seams of quartz are to be found in the country. These generally contain lenticular bodies and stringers of quartz and are rather to be regarded as bedded deposits, although generally claimed as fahl bands. Among this class may be cited the Scramble, near Rat Portage, the Flint Lake on Flint lake and the Little Bobs on Denmark lake. Bedded or lenticular or segregated veins are the usual form of ore deposits in schistose rocks, and these occur in great variety in Western Ontario.

At the Sultana, a series in sheared porphyritic gneiss have produced a large amount of gold. At the El Dorado on Eagle lake a bedded deposit in sheared granite is being developed with satisfactory results. At the Big Master, a bedded vein in chloritic schist has produced a large amount of gold. The Gold Hill veins, the Black Jack and Golden Gate veins in Hornblende schist have been worked with satisfactory returns.

The Olive, in the Seine River district, lying in a

of the cutter is such that it takes a clean curling chip from wrought iron or steel—no top grinding being necessary. The accompanying cuts illustrate several of the cutting devices and holders made by this company. Figs. 1 and 2 show a straight shank tool holder in position for lathe and planer work, so arranged as to give an idea of their adaptability to work in close corners. Figs. 3, 4, 5, 6 and 7 give illustrations of the various uses of offset tools. Figs. 8, 9, 10 and 11 show the boring tool and its method of operation. In Figs. 12, 13 and 14 are illustrated the Armstrong planing tool. Fig. 12 shows the tool at work in close corners, giving a general idea of clearance obtained. It shows also a few of the angles at which the cutter can be set. A job similar to one above could be finished with the Armstrong planer tool without shifting position of the work on bed.

Fig. 13 shows the planer tool cutting a keyway with the cutter reversed and the tool turned around, thus throwing the cutting point behind center of tool and practically working as a "goose-neck" tool.

sented in these notes it is expected that these characteristics will be permanent to any depth, and, since from a geological standpoint there is no reason why the deposits themselves may not run to as great depths as are practicable to mine, it would seem that, in spite of many disastrous failures up to date, as soon as the era of "wildcatting" and stock jobbing passes over money and common sense will ultimately make a profitable, permanent mining industry in Western Ontario.

Galena is invariably associated with high values in gold in the Sultana, Mikado, Golden Horn, Golden Star, Olive, Foley, Champion, Treasure and Big Master mines.

Zinc blende is of the highest value as an indicative mineral in the veins of this district, and wherever quartz is found with disseminated zinc blende it is safe to say it is rich in gold. The richest ore in the Foley, Golden Star, Sultana, Champion, Golden Horn, Sakoose and Big Master, as well as in the

*Trans. Can. Min. Inst.

Armstrong Tool Holders.

bed of schistose diorite, is also auriferous and has produced a good deal of gold.

The Golden Horn, on the Lake of the Woods, in chloritic schist, is being actively developed with satisfactory results. The Wendigo, on the Lake of the Woods, is working a bedded vein in a band of pyritous hornblende schist which carries a workable amount of gold.

A number of interesting occurrences may be cited to show the widespread diffusion of the precious metal in this district and the varying character of the auriferous deposits.

On Gold brook, near the Mattawan river, a number of locations have been taken up on a band of fine-grained gneiss, with sparsely disseminated grains of iron pyrites, which carries gold throughout from a trace to 50 cents per ton. This deposit is nearly $\frac{1}{2}$ mile wide and several miles long, and although the gold content is too low for profitable working, the occurrence must be regarded as highly interesting from a theoretical standpoint.

At the Hammond Reef, a band of shattered granite with quartz-filled seams has been found to carry a workable amount of gold over a width of 300 feet and a length of some miles.

On Shebandowan lake a number of very coarsely crystalline dikes of porphyry carry from a trace to \$20 per ton.

On Eagle lake a band of schistose granite 30 feet in width is being worked with satisfactory results.

A large number of locations have been taken up on felsite dikes, many of which carry gold per se as well as in the fissures now filled with quartz, which were produced by the shrinkage of the dike rock in cooling or by subsequent movements along the line of weakness which caused the primary dike fissure. Among these may be mentioned the Bully Boy on Camp bay; the Champion, near Rat Portage; No. 2 vein at the Big Master on the Manitou, and the Sakoosie in the New Klondike, all of which have been proved to contain workable amounts of gold.

A Montana Gold Mine.

The Garnet gold mine, near Pony, Madison county, Mont., is driving a new tunnel started on the hillside back of their mill. A new power plant is to be in-

realgar (As_2S_3) and orpiment (As_2S_3), and at Nagy Ag, in Transylvania, Hungary, it is found in metallic condition. Arsenical ores occur widespread in the United States, especially in the West.

Previous to 1899 the supply of arsenic and its compounds was derived almost entirely from the mines in Cornwall and Devon, England, and near Freiberg, Germany; but the closing of the Devon Great Consols mine, near Tavistock, in 1901, called for an increase or new supply from other localities.

In 1900 Canada contributed a small quantity, which has since been largely increased; and in 1901 the United States became a producer on a small scale, and more than quadrupled its output in 1902.

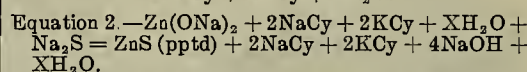
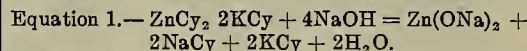
Although arsenical pyrites (mispickel $FeS_2 + FeAs_2$) has been reported in many localities in Ontario, the entire production of arsenic in Canada during 1901 and 1902 was obtained from the arsenical gold ores of the Deloro mine in Hastings county, which is owned and operated by the Canadian Gold Fields, Ltd., a London corporation.

In addition to the gold, which assays from 8 to 15 pennyweights per ton, the ore consists essentially of quartz impregnated with arsenical pyrites and occasionally with copper pyrites, frequently accompanied by a large proportion of iron pyrites. The ore is crushed and amalgamated, yielding directly from 57% to 60% of the original gold value in the ore. The pulp is then concentrated, the concentrates carrying practically the balance of the gold and the arsenic, and the tailings containing less than 2% of the gold in the ore and but 0.5% of arsenic. The concentrates are treated by the Sulman-Teed bromo-cyanide process, and from 87% to 92% of the gold content is extracted, the total recovery of the gold amounting to approximately 90% of the original gold value in the ore. The concentrates contain approximately 30% of arsenious oxide and 16% of sulphur, and to extract the arsenic they are dried and roasted in a revolving cylindrical furnace, the condensed fumes therefrom forming a crude product of 85% arsenious oxide and from 2% to 4% of sulphur. The crude arsenious oxide (called crude arsenic) is refined by sublimation in a reverberatory furnace, and the hot gases therefrom containing the volatile arsenious oxide have the impurities settled out by passage through a number of heated flues. Finally the fumes are delivered to a large brick chamber where the refined arsenious

Regeneration of Cyanide Solutions.

TO THE EDITOR:—I have just had my attention drawn to an article in your issue of May 30, on the "Regeneration of Cyanide Solutions After Zinc Precipitation," by Andrew Crosse, and read by him before the Chemical Society of South Africa.

Five years ago I devised a method for regenerating sodium or potassium cyanide from the double cyanide of zinc and sodium or potassium, and two years ago I took out a patent in this country (patent No. 689,017), which was an improvement on the method which I had first employed. This process of regeneration is at present in use in several plants in the West. At the Chloride Point mill, Utah, when my process for regeneration was first installed there, the plant ran for over a month without the addition of any fresh cyanide, using instead the cyanide regenerated from the double cyanide of zinc and potassium held up in solution. I found that to obtain good precipitation at the ordinary temperature with sodium sulphide, the double cyanide of zinc and potassium had first to be dissociated by the addition of a certain amount of alkali, when 60% to 75% of the zinc contents (depending on the quantity of the zinc present and also the amount of free cyanide present) could be precipitated without leaving free sulphide in solution, but to obtain complete precipitation of the zinc heating of the solution had to be resorted to.

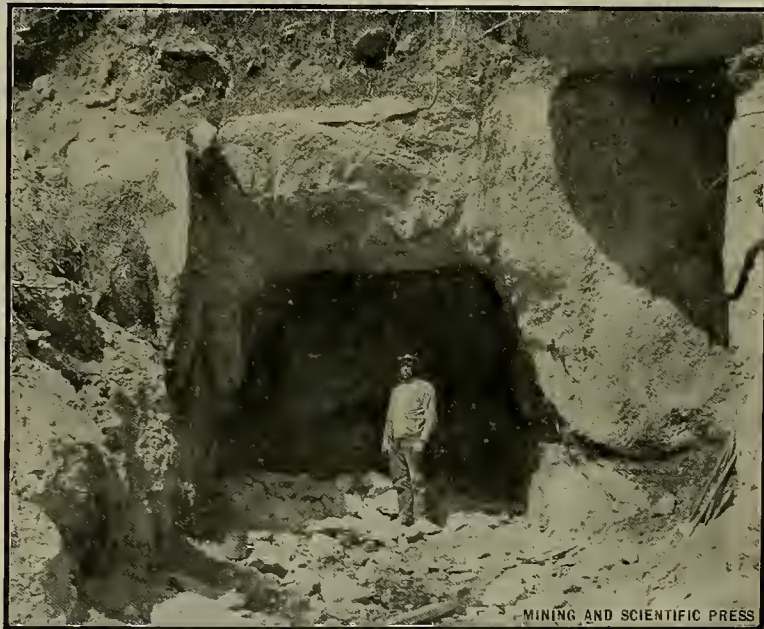


Heating of the solution to obtain this object is not practicable, as it is neither necessary nor desirable to entirely remove the double cyanide of zinc and potassium from solution, and a clean active solution can be kept by the occasional precipitation of the zinc as mentioned above; besides, heating the solution to a point sufficient to throw down all the zinc produces a reaction between the sulphide and cyanide, forming sulphocyanide, a compound which is much more harmful in the solution than considerable double cyanide of zinc and potassium.

Another very beneficial result of the removal of the



Garnet Camp and Mill, Pony, Montana.



Entrance Garnet Tunnel, Pony, Montana.

stalled and the tunnel driven by means of electric drills. It crosscuts the formation and is expected to reach the vein developed in the upper workings in about 1300 feet. The accompanying illustrations show the camp and mill of the Garnet Company and also the entrance to the new tunnel. E. L. Ballou is superintendent.

The Production of Arsenic.*

Written by JOSEPH STRUTHERS.

The production of arsenious oxide (white arsenic) in the United States during 1902 was 1355 short tons, as compared with 300 short tons in 1901. The entire product was made by the Puget Sound Reduction Co. at Everett, Wash., which began the manufacture of this important substance in 1901. The largely increased output in 1902 is a very favorable sign of the success of the new industry.

Arsenic occurs widely distributed in nature, but only in a few localities in sufficient quantity to be of commercial value. The most frequent combination is with iron and sulphur, forming the mineral arsenopyrite (mispickel). With sulphur alone it occurs as

oxide is collected, ground to 100-mesh size, and automatically packed in wooden kegs, each holding 500 pounds. The marketable product contains from 99.6% to 100% of arsenious oxide, the remaining impurity consisting of silica in a finely divided condition.

By far the greater part of the arsenious acid manufactured at Deloro during the last four years has been shipped to New York to supply the demand in the United States. Practically the entire supply derived from Canada and the United States is consumed in this country. The domestic production, however, even though aided by imports from Canada, was not sufficient to supply the demand for 1902, and there were imported from Canada, England, Germany and Spain during the year 1,385,700 pounds of arsenious oxide, valued at \$42,424, and 6,725,198 pounds of arsenic sulphide and orpiment, valued at \$237,631.

The production of white arsenic in Canada was 52 metric tons in 1899, 275 tons in 1900, 630 tons in 1901 and 726 tons in 1902.

The chief use for arsenious oxide is in the manufacture of Paris green, although it is used to a minor extent to make Scheele's green, London purple, lead arsenate, sodium arsenate, potassium arsenate and other arsenic salts.

zinc by the sulphide in this process is that during the precipitation the zinc carries down, sympathetically I think, other salts (such as antimony, arsenic and considerable lime as sulphate) which are detrimental to the solution.

After several years experience with this process I have never found the alkali increase in solution, as one would expect from the equation, possibly because in every case the ore on which the solution was used had an acid reaction.

Regeneration of the H_2S from the ZnS_2 , as suggested by Mr. Crosse, has not been used here, as it was found more economical to use Na_2S (solid, containing 66% Na_2S), which costs from 2 cents to 3 cents per pound delivered at the plants in 500-pound drums.

The cost of regeneration of the sodium cyanide from the double cyanide of zinc and sodium by my method is from 3 cents to 5 cents per pound of sodium cyanide regenerated, depending on the amount regenerated and the cost of chemicals at the different plants.

My object in drawing your attention to this article is to show that the method suggested by Mr. Crosse, to be used by the cyanide operators in South Africa, has been in use in this country for some years.

Denver, Colo., June 14.

WILLIAM ORR,

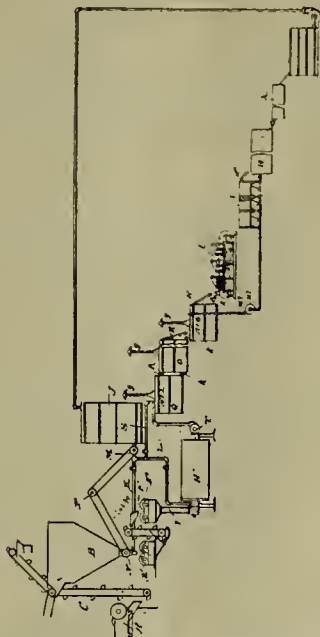
* Extract United States Mineral Resources.

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 9, 1903.

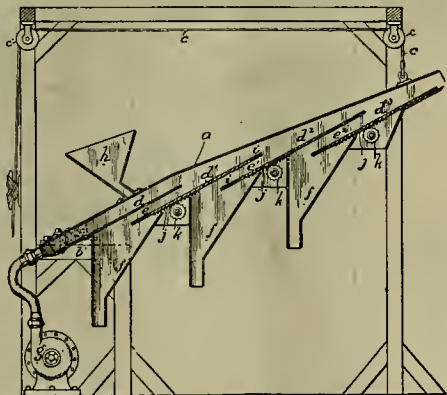
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR EXTRACTING METALS FROM ORES.—No. 729,805; J. Stoveken, Cripple Creek, and L. Stoveken, Florence, Colo.



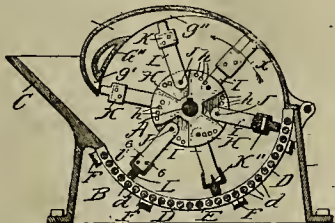
In apparatus extracting precious metals from ores, means whereby ore reduced to finely divided or comminuted state in presence of solvent, series of overflow tanks arranged receive mixed ore and solvent from reduction means; tanks containing means for agitating ore and solvent, and filter arranged to receive mixed ore and solvent from last of overflow tanks, adapted separate solution from ore.

SEPARATOR.—No. 730,229; J. T. Burr, Glenville, Ohio.



Separator for separating mass of matter into component portions composed of particles approximately equal in specific gravity, consisting of longitudinal hollow body, having base formed of series of upwardly inclined planes inclined at angles slightly exceeding critical angles of material and presenting extended frictional surfaces in planes intercepting at small angles line of movement of material under force of current, separated at ends from one another to form escape outlets between adjacent planes, inlet for mass of material adjacent to lowermost inclined plane, and means to induce current of fluid upward through hollow body over inclined planes.

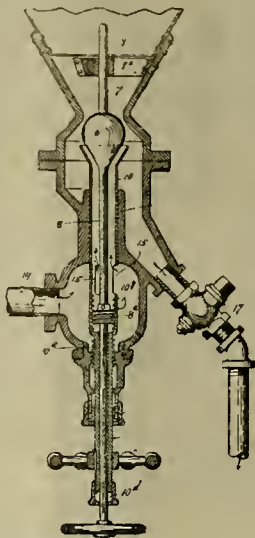
CRUSHER AND PULVERIZER.—No. 730,503; M. J. Williams, St. Louis, Mo.



In crushing and pulverizing machine, combination with casing, of disintegrating means therein including plurality of pivoted beaters and operating means

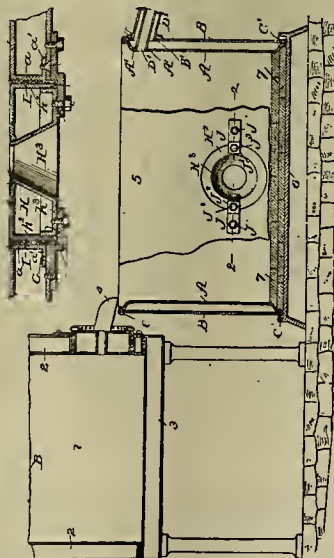
therefor, each beater comprising shank, head formed with socket to receive end of shank and oppositely disposed pockets opening into socket, and means in pockets for securing head to shank and regulating weight of head without changing position of head on shank.

HYDRAULIC CLASSIFIER OR SIZER.—No. 729,764; J. F. Isbell, Denver, Colo.



Hydraulic classifier or sizer, combination of upright casing having funnel-shaped top, valve chamber below funnel, reduced part below valve chamber, enlarged part below reduced part, and another reduced portion below enlargement, tube located in casing filling reduced portions, passing through enlargement, and protruding into valve chamber, valve chamber extremity being outwardly flared or funnel shaped, tube being open where it passes through enlargement to allow water to enter, opposite extremity protruding from casing, supply conduit connected with casing enlargement, valve located in valve chamber adjacent lower extremity of funnel, lower portion valve being surrounded by upper extremity of tube, valve being provided with stem passing downwardly through tube large enough allow water flow upward freely around valve stem from casing enlargement, valve stem fitting tube below casing enlargement and protruding below same, tube and valve being adjustable vertically in casing.

SMELTING FURNACE.—No. 730,610; E. Campbell, Rossland, Canada.



Combination in receiver for use in connection with smelting furnaces, of inner and outer plates spaced apart forming water jacket and provided with opening for tapping jacket, inner plate being provided with outwardly projecting wing surrounding opening and at outer edge with flange underlying outer plate, rivets securing such flange and outer plate together, tapping jacket fitting in opening in side of receiver, and composed inner cup-shape section having central opening, and outer section having outer plate provided with edge flange threaded into outer end of cup section and provided with inwardly tapering central tube threaded in central opening in cup-shape section, and means for securing tapping jacket in connection with body of receiver.

AMMONIA-CYANIDE PROCESS OF TREATING COPPER, NICKEL OR ZINC ORES CONTAINING PRECIOUS METALS.—No. 730,836; D. Mosher, San Francisco, Cal.

Process of treating refractory sulphur, tellurium and arsenical ores containing copper, zinc, nickel,

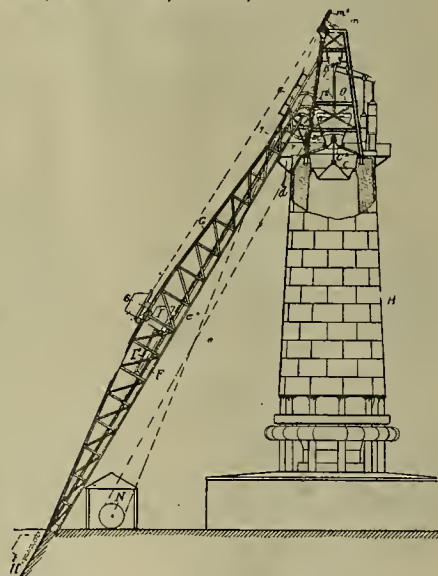
gold and silver, consisting in roasting ores at low red heat to transform metals into sulphates, arsenates or tellurates; oxidizing reducing compounds by dilute ammonia, and subsequently extracting metals with ammoniacal cyanide solution containing excess of cupric oxide or hydroxide over and above that necessary to form metallic cyanide double salts.

APPARATUS FOR REMOVING DRILL TOOLS FROM WELLS.—No. 730,460; F. G. Irvine and J. B. Braden, Salem, W. Va.



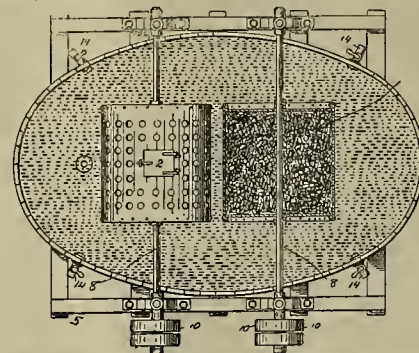
In apparatus for removing drilling tools from wells, combination with casing adapted for endwise reciprocal movement, of grab to be lowered into casing, having means for interlocking grab with casing and also with drill tool to provide for simultaneously reciprocating latter with casing to loosen tool and to draw it out of well by manipulation of casing.

BLAST FURNACE CHARGING APPARATUS.—No. 730,799; E. G. Rust, Pueblo, Colo.



Apparatus for charging stock to blast furnace, etc., combination of two sets of tracks one above another leading to charging opening of furnace, each set of tracks having independent discharge device, with cars constructed to operate upon tracks.

APPARATUS FOR THE PRECIPITATION OF METALS FROM SOLUTIONS.—No. 730,385; P. W. McCaffrey, Denver, Colo.



Apparatus for precipitation of dissolved metallic values, combination of tank adapted to hold solution to be treated, perforated receptacle containing scrap metal, perforated walls of receptacle being composed entirely of same material, receptacle partially immersed in solution and mounted to rotate therein, whereby solution is made to circulate through scrap metal.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence.)—The Ebner G. M. Co. at Juneau are grading for a 100-stamp mill, thirty of which they will put in this season. They have fifteen stamps in the old mill, which are in operation.

At the Sheep Creek mine, near Juneau, O. R. Meyer, who has a bond on the property, is preparing for further development work and additional equipment. There is a 30-stamp mill at the mine, twenty stamps of which are dropping.—F. Brock of Douglas City, part owner in the Bessie G. M. Co., operating near Juneau, says a 10-stamp mill will be built this summer, some machinery for which is on the ground.

The Rodman Bay G. M. Co., operating at Rodman Bay, 90 miles from Juneau, are building a 100-stamp mill, says G. E. Bent, manager.

Juneau, June 12.

The Alaska-Perseverance tunnel, near Juneau, is in 1200 feet and the crew has been increased to twenty-one men. Two machine drills are in operation.—The Northern Homestake M. Co. has been incorporated at Phoenix, Ariz., with C. E. Lovett of Duluth, Minn., J. Wagner and A. S. Lovett of Juneau, to operate a group adjoining the Alaska-Atlin property on the south, and is said to be on the same lode as the Ready Bullion mine on Douglas Island.

ARIZONA.

COCHISE COUNTY.

At the Commonwealth mine, near Pearce, they will sink below water level. They are pumping out of the mine 10,000,000 gallons of water, and have pumps capable of handling 4,000,000 gallons of water per day.

At Tombstone they have been pumping from the Consolidated mine 2,300,000 gallons of water per day. The result of the pumping operations shows they have drained for a depth of 30 feet below the permanent water level, says the Bisbee Review. The company is adding more boilers to its plant.

The May output of the Calumet & Arizona mine, near Bisbee, amounted to 2,130,000 pounds of copper. The equipment for the third furnace is on the ground.

The Longhunt mine at Tombstone is to be reopened.

The Calumet & Western D. & M. Co. of Calumet, Mich., has been organized under Arizona laws, with F. S. Carlton, J. Bosch, W. B. Anderson and J. Daniel as officers.

W. N. Edwards, I. Diamond and G. Monroe have bought the Eureka group of claims, 3 miles from Bisbee. There are eleven claims in the group. Development work will begin next week.

Superintendent J. Reay of the Atlas Exploration & M. Co. at Clenega Springs, near Douglas, says he has put men at work sinking a shaft on the Indiana claim, which has a showing of copper.

GILA COUNTY.

T. Crandall of Phoenix, superintendent of the Confederate M. Co. group in the Tonto Basin district, north of Globe, says he will put in an electric drill and a hoist.

GRAHAM COUNTY.

The Sierra del Oro G. M. & M. Co. has begun development work on their group of claims in the Greenlee district, near the Frisco river, 5 miles north of Clifton. The mines will be opened up by tunnels, and the ore conveyed to the milling plant on the river by tramways. F. P. Elredge, of Chicago, Ill., is president and B. M. Crawford, of Clifton, director and manager.

MOHAVE COUNTY.

It is reported a 10-stamp mill will be built at the Clay Springs group of mines in Musio Mountain district, near Kingman. There is a supply of water at Clay Springs, which will be brought in to be used in the mill. The mines show bodies of free milling gold ore.

The Mohave G. M. Co. will build 23 miles of narrow-gauge road connecting the mine and mill and then to the bank of the Colorado river, opposite Needles, Cal. The road may be carried to the Gold Road mine, says the Mohave Miner.

PIMA COUNTY.

The Producer M. Co., in Quijotoa district, reports work progressing in building their smelter at Brownell. There are 100 men at work.

The Banner M. Co. will build a 100-ton concentrating plant on its group in the Sierra mountains, near Tucson. The veins carry copper, lead and silver.

YAVAPAI COUNTY.

(Special Correspondence.)—Superintendent J. Farrell of the McCabe mine of the Model G. M. Co., at McCabe, in Chaparral district, is retimbering the parts of the shaft damaged when the mill was burned. He started rebuilding the mill this week, which will have a capacity of 100 tons daily.

McCabe, June 16.

In the mill at the Octave mine at Octave forty stamps are dropping on the ore, which is afterward treated by the cyanide process, and 4000 tons per month are handled. There are 14 miles of piping necessary to bring water to the property on the gravity system, and oil is used for fuel. J. R. Leonard is manager and A. E. Hurley superintendent.

Manager B. Blanchard of the Iron King mines in Bradshaw mountains, southeast of Prescott, reports an electric plant will be put in.

CALIFORNIA.

ALPINE COUNTY.

The Curtz-Evans mill at Loope started up last week. They have a 2-mile tramway leading to the mine, a complete electric light system and abundant water power.

AMADOR COUNTY.

(Special Correspondence.)—It is reported the Lincoln mine is about to start extensive exploration work with a diamond drill. The mine is developed to a depth of 2000 feet, the principal work having been done west of the shaft.

Sutter Creek, June 17.

CALAVERAS COUNTY.

W. Lanigan, assistant manager of the Royal mine at Hodson, says the 120-stamp mill will be ready for operation by August 1.

The 14-inch pump at the Forty-nine gravel mine at Douglas Flat is expected to be in operation this week, says J. Evans, superintendent.

The Utica Co., at Angels, expect to close down the Utica shaft on July 1st, and future operations will be conducted through the Cross shaft.—Work at the Sultana mine is progressing and the shaft is down 700 feet. Arrangements are being made for putting in machinery. The 10 stamp mill is running steadily.

The new system of treating the sulphurets at the Melones mine, at Melones, was put in operation last week, says the Angels Record. It is the "barrel" system, consisting of a steel barrel 16 feet long and 30 inches in diameter, being swung on a shaft and made to revolve at rapid rate; barrel has number of steel balls inside, grinding the sulphurets, which are fed in at one end, into a fine powder; powder comes out at the other end of the barrel, where it is run into the precipitation tanks for treatment. Two electric motors, one 20 H. P. and a 30 H. P. are used.

The Chicago and Pennsylvania men, who have bought the Stockton Hill placer mining properties, consisting of the Stockton Hill, Clover Leaf and Hexter mines, near Mokelumne Hill, have men at work. Machinery is being put in to equip the first-named mine, consisting of an 80 H. P. boiler, two 25 H. P. engines, a pump with capacity of 12,000 gallons per hour, 3 stamp mill, with a capacity of 75 tons in 24 hours, rock breaker, etc. Crude oil, which can be delivered at the mine for \$2 per barrel, will be used for fuel. The Clover Leaf and Hexter will also be provided with machinery later on. It is expected to have the plant in operation by October 1st. The two principal operators are K. H. Seibel, of Chicago, Ill., and H. Yeager, of Forty Fort, Penn.

EL DORADO COUNTY.

(Special Correspondence.)—P. Morgan and G. Levaggi are about to reopen the Mount Pleasant mine, near Grizzly Flat, and expect to make extensive improvements and developments. The Mount Pleasant vein is a strong ledge 3 to 14 feet wide cropping along the surface for several thousand feet. It has produced over \$3,000,000 from a single ore shoot in the vicinity of the shaft sunk near the mill. In addition to this shaft, which is over 800 feet deep, there are several other shafts of lesser depth, with extensive development of levels. The formation of the country is granite and the Mount Pleasant vein is one of a system of veins. Grizzly Flat, June 16.

C. B. Coulter of San Andreas, Calaveras county, reports finding free gold in quartz near the Ritter mine, near El Dorado, last week.

FRESNO COUNTY.

The directors of the Blue Diamond Oil Co., whose office is in Grass Valley, have decided to resume operations by July 1 on their ground at Coalings.

KERN COUNTY.

(Special Correspondence.)—The Merle B. M. Co., owning a group of three mines

at Havilah, report development work progressing. The ore runs \$44 per ton. A shaft is being sunk and two tunnels driven. W. T. Smith of South Pasadena is president.

Havilah, June 16.

President J. M. Wright, of the Peerless Oil Co., operating near Bakersfield, in his report says since November, 1902, eight additional wells have been completed and two more are drilling. The completion of these two wells will give a total of twenty-four operating wells. Two additional 70 H. P. hollers have been set at power station No. 1, two of same at power station No. 2, and two 55 H. P. hollers at pipe line pumping station. Two reservoirs have been built, with capacity for 60,000 barrels and for 100,000 barrels, respectively. These, with reservoirs 1, 2 and 3, give a total storage capacity of 230,000 barrels. The oil flumes have been torn away and replaced by a system of surface pipe lines, conveying the oil from wells and sump holes directly into reservoirs. Their production averages 4400 barrels per day. After finishing the next well (new No. 3) and after cleaning out certain wells which have become clogged, the production is expected to be 5000 barrels per day.

A. B. Canfield and G. E. Whitaker report striking oil last week in the first well on their property, 5 miles west of McKittrick. The oil was struck at a depth of 900 feet.

MARIPOSA COUNTY.

The Exchequer G. M. Co. has bought the O'Brien-Marriner group of five mines on the Merced river, 6 miles north of Hornitos, and work has begun with twelve men. M. O'Brien is superintendent. Development is by tunnels. Those forming the Exchequer Co. are the members of the Big Casino M. Co., operating at Groveland, Tuolumne county.

NEVADA COUNTY.

Two more concentrators to be used in the mill at the Oustomah mine, near Grass Valley, are being set up. As soon as they are in place the stamps will be started to dropping. The sand plant is ready for operations.

The Buckeye mine in Willow valley, near Nevada City, will have a mill this season, says Superintendent T. B. Gray.

Superintendent Coffin of the Central Con. mine near Banner Hill, near Nevada City, reports opening up a body of free gold ore in the tunnel.

It is reported W. F. Englebright, F. Zettler, F. Searls and J. Eddie will open up the Zeibright mine in Bear valley, near Grass Valley.

The rock crusher and other machinery for the Junction mine at North San Juan are being set up, says H. Huckins of Grass Valley, who is superintendent for Eastern men holding a bond on the mine.

ORANGE COUNTY.

Thirty-one wells are being drilled in the Fullerton oil fields and three rigs are in course of construction.

PLUMAS COUNTY.

Machinery for the Feather River M. Co.'s cement gravel mine at Iron Bar has been shipped from San Francisco, is reported on the ground, coming in via Beckwith, says Superintendent Goodhue, and it is expected the mill will be in operation by August 1. The company will begin operations on their quartz mine at Shoo Fly, near Crescent Mills, this month, and to that end have located a water right of 5000 inches at Shoo Fly falls. The water will be taken out at the falls and carried by flume 3300 feet to Shoo Fly bridge, near which a 500-foot tunnel will be driven.

SAN BERNARDINO COUNTY.

Work on the Higgins group on Newberry mountain, near Newberry, is reported progressing. At the end of the 150-foot tunnel drifting is being done on the ledge, the drift being in 50 feet, showing 5 feet of ore averaging \$10 per ton.

SAN DIEGO COUNTY.

W. R. Farnsworth reports finding molybdenite in his Dewey mine at Grapevine, near Warners Hot Springs. Some of this ore assayed 5% in molybdenum and \$12 in gold from the 60-foot level. The mine is developed to depth of 100 feet. There are 200 feet of crosscuts.

F. Salmons, of Pala, a director of the Lithia Chemical Co., which is operating a group of twelve lepidolite claims at Pala, says a reduction plant to handle the mineral will be built either at San Diego or at San Bernardino. Heretofore the ore in bulk, as taken from the mine, has been shipped direct to New York at a cost of \$450 per car, and \$25 per ton was still being made on the ore at the mine, says the San Diego Union.

Manager Phillips of the Douglas-Lacey Co. of New York has men at work unwatering the Owens group and cleaning out the drifts in the Washington mine near Julian.

SIERRA COUNTY.

W. H. Martin, of Nevada City, Nevada county, says the Sierra-Buttes mine, near Sierra City, has its 20 stamp mill running steadily.—The Keystone mine has run a crosscut and tapped its ledge, running along its course a distance of 300 feet, showing milling ore; 150 feet more will bring it under the shoot in the upper workings.—The Butte-Saddle mine has been bonded to M. Felin for five years.—The Sierra-Butte No. 2 mine, owned by W. H. Martin and San Francisco men, will be worked this season.

SISKIYOU COUNTY.

The Etna Advance says the Corey group of mines, adjoining the Tetherow & Co. (Highland group), at the head of China gulch, near Etna, was sold last week to J. M. Hadley, S. C. Phillips and W. Werst for \$10,000. The ore carries free gold.

The Blue Gravel mine, near Yreka, has been sold to A. W. Williams, who will put in electric power.

TRINITY COUNTY.

The Boyce & Breuner mine on Buckeye creek, near Carrville, has been sold to the California Surety G. M. Co. for \$5500. The company has incorporated at San Francisco with the following directors: C. W. Doe, C. V. Kaufman, S. V. Smith, H. Hume and J. R. Pringle.

The cyanide plant of the Northern Headlight mine, 2 miles from Carrville, on Coffee creek, was destroyed by fire on the 12th inst.; loss, \$10,000. It was started by an explosion of gasoline in the assay office. The general clean-up had been made two weeks ago and the product of the run shipped. The final clean-up, however, was being completed and the values sealed and stored in a room over one of the tanks. Those values, which amounted to \$7000, were saved by dropping into the solution tank under the burning building. This tank and four agitator tanks were the only ones saved from the fire. The Northern Headlight is owned by L. M. Hoefler of San Francisco and a company of Mexicans. The plant will be rebuilt.

TUOLUMNE COUNTY.

W. P. Cunningham has bonded the Blue Bell, the Turnback and the Rosella quartz mines near Carters for \$10,000.

COLORADO.

BOULDER COUNTY.

The Wano M. & D. Co., near Wall Street, is building an experimental process mill for the treatment of ore. If it proves a success, it is expected a mill of 100 tons daily capacity will be put up.

New York parties have bought the Golden Age mine, near Jamestown, for \$250,000. They are planning to build a cyanide mill and an electric power plant. C. H. Tallmadge is manager and M. J. Swisher superintendent.

In crosscutting from the main shaft in the Tambourine mine, near Wall Street, a body of low-grade ore has been struck, 20 feet wide and showing gray copper. Average value is \$9 gold per ton. The owners of the Tambourine are planning the erection of a cyanide mill.

The United States Co., composed of New York men, is developing a property in Deland gulch, near Caribou.

Coffin Bros. are operating the Confidence group, on Eldorado Mt., near Eldora, owned by G. W. Coffin & Sons. It is equipped with a shaft house, pump and a whim. The developments on the group consist of a 130-foot shaft and 350 feet of drift. The Confidence vein is 6 feet wide; the Lucky Find, 10 feet, and the ore carries tellurides and sulphides.

CHAFFEE COUNTY.

The Colorado F. & I. Co. has put in a 25 H. P. electric motor for pumping at coal mine No. 5, near Turret. Two other motors are to be placed—one for ventilating the mine and the other for screening.

CLEAR CREEK COUNTY.

The Standard group of mines and mill, up Fall river, near Yankee, were sold last week to the Colorado-Oregon M. Co. for \$150,000. The Oregon Co. is composed of Des Moines and Burlington, Ia., men, and D. V. Davidson is manager. They have been working a group of thirteen claims adjoining the Standard property for some time, and last winter opened up gold-bearing shoots which found their extension in the Standard group. The Standard has a mill with capacity for handling 125 tons of ore per day, and has both steam and water power. In addition to the two 100 H. P. hollers, it has a Corliss engine, a 12-drill air compressor and an electric light and power plant. The Standard group of claims have been opened up by a tunnel 1000 feet in length, showing different veins, several of which have been drifted on.

A shipment of thirty tons of lead concentrates was made from the Meadota mill at Silver Plume last week. An auto-

matic crusher feeder has been put in which carries the ore into the mill from off the dump and delivers it to the crusher.

The Continental Electric Power & I. Co. was incorporated last week by G. Haggett, W. P. Clough, C. S. Birkin, F. G. Shaffer of Clear Creek, with E. H. Martin, S. W. Mark and L. C. Bates. Its object is to furnish electric power for mining and milling in Clear Creek valley by utilizing the waters of Middle Clear creek at Empire, supplemented by a series of reservoirs. It is claimed from 3000 to 5000 H. P. can be generated, and 2000 acres of arid land irrigated. The object includes a general electric lighting business for the cities of the district. Work has been started on the main power plant at Empire.

DOLORES COUNTY.

Operations are under way at the Robinson group of mines in Horse Gulch district, near Rico, and the miners are drifting on the main tunnel.

OILPIN COUNTY.

Sinking operations were begun at the Cook shaft, near Central City, with three eight-hour shifts, and it is intended to sink the shaft a farther depth of 500 feet, which will take it to 1400 feet. To reach depth of lowest workings of the Bohall, it will be necessary to sink 250 feet, while 330 feet deeper than its present depth will reach the lowest workings on the Flak. The work of pumping and leasing is being done under direction of the receiver. O. B. Thompson is manager and W. H. Davis is superintendent. It is the intention of the operators to discard the Gregory incline workings and replace the steam machinery with electric plants, the power to come from the South Boulder section. There are fifty men, including lessees, at work on the group, but this number will be added to as new ground is opened up.

LAKE COUNTY.

Diamond drill explorations, besides opening up the silver, lead and iron deposits above the parting quartzite in the Coronado mine at Leadville, have at a depth of 75 feet farther struck copper deposits, says the News-Dispatch. This ore body is 300 feet below the bottom of the Coronado shaft and is said to overlay the Cambrian quartzite. Besides copper, it carries values in gold. Further drilling will be done to determine the size of the deposit.

MINERAL COUNTY.

C. R. Chapman of Bachelore has a two-year lease on the Punxsutawney claim on Campbell mountain, near Creede, paying a royalty of 12 1/2% on the net smelter returns.

There are 200 tons of crude ore passing through the Humphreys concentrating mill daily, making from forty to forty-five tons of concentrates per week, and only half of the jigs running, says the Creede Candle. An addition of nine concentrating tables is being made. With the addition to the tunnel equipment of a number of cars and several horses, it is expected to supply the mill with enough ore to run it at full capacity. With the increase in machinery it is expected to be able to handle 350 tons per day.

SAGUACHE COUNTY.

The Rough Rider G. M. Co. has a bond and lease on the Boston lode, near the Cochetopa, and have begun operations. A vein is showing that carries 34 gold per ton. If the vein proves continuous, an electro-chemical plant will be built.

SAN JUAN COUNTY.

F. House, C. F. Meek and J. Patterson, owners of the Iselde group of mines in Burrows Park, near Silverton, report making ore shipments. The extension of the railroad to be built from Eureka to Animas Forks will pass within 2 miles of the Iselde mine. Other companies operating in the Burrows Park section propose to increase work this season. The Bon Homme, owned by St. Louis, Mo., men, will resume, while the Tobacco Co. will put their 100-ton mill in operation. Manager Meek of the Lion tunnel, which is expected to cut many veins in the Burrows Park district, will again start up the machine drills.

Work was resumed last week on the Stober tunnel of the Silver Lake Co., east of Silverton. It is purely a tunnel site and the bore, which will eventually cut the Nevada vein, has its entrance on the hill above the Silver Lake power house and below the Aspen workings. At present work is being done by hand, but it is expected that machines will be put in this month. They are in 1500 feet.

SUMMIT COUNTY.

It is reported a body of good grade lead ore has been struck in the Lightburn tunnel in Gold Run, near Breckenridge.

The Casbler mine and mill, near Breckenridge, are making regular shipments of

concentrates to the sampler, says Manager Wood.

TELLER COUNTY.

Arrangements have been made whereby the Accident mine on Gold hill, Cripple Creek, will be worked through the Pointer shaft. By this the Accident can be worked at a depth of 100 feet below its present lowest level. To reach the ore shoot B. T. Hickman, who has a bond and lease on the Accident, will have to drift 50 feet beyond where the bottom Pointer level ends.

The following payroll distributions for May were made in Cripple Creek district last week:

Locality.	Men.	Total.
Battle	1,685	\$176,952 00
Ironclad	88	8,137 02
Guyot	181	18,027 60
Bull	1,531	160,755 00
Mineral	58	5,685 00
Raven	368	32,452 00
Beacon	264	53,136 00
Gold	540	53,136 00
Squaw	61	6,093 30
Tenderfoot	44	4,295 50
Womack	37	3,785 01
Globe	58	5,272 20
Cow	31	2,963 40
Grouse	10	948 00
Galena	9	810 00
Straub	27	2,527 20
Big and Little Bull	4	420 00
Lincoln	10	1,050 00
Copper-Rhyolite	54	4,999 20
North of Gillett	18	1,620 00
Rose Bud	7	630 00
Phonolite-Trachyte	23	2,070 00
West of Cripple Creek	35	3,150 00
Carbonate	1	105 00
Lines allied with mining	1,052	163,363 90
Total	6,286	\$654,778 21

There will be a decided increase in the payroll within the next ninety days. Just as soon as the water is tapped by the drainage tunnel and the various levels of the mines that are affected are recovered more men will be required for mining operations.

A good tonnage of ore is being made daily from the American Eagles and Abe Lincoln mines, owned by the Stratton Cripple Creek M. & D. Co., at Cripple Creek. The average of two broad-gauge carloads of ore a day being shipped from each averages \$45 gold per ton. On the American Eagles mine a washing machine is to be put in and all the rock in the dump will be handled. The machine will have a capacity of 200 tons of rock a day. In the American Eagles mine the ore is being broken in the fifth, eighth and eleventh levels. On the Abe Lincoln most of the ore is being broken on the bottom level in the ore shoot recently struck.

IDAHO.

ADA COUNTY.

The X Ray Con. G. M. & M. Co. has men at work grading for buildings at the mouth of the proposed X-Ray tunnel, 8 miles above Boise. The company has seventy-one claims in Black Hornet district, says Manager Dooley. The tunnel will start in Maynard gulch at elevation of 150 feet above the river and will pass under the Black Hornet mine at depth of 1639 feet, and is expected to be 2 1/2 miles in length. The Highland Valley Power Co. will furnish electric power for drills and tunnel cars, and lights for tunnel. A large smelter is proposed as soon as sufficient ore has been developed.

BOISE COUNTY.

Perce et al. of Denver, Colo., have bought the Wells group of three claims near Grimes Pass, near Idaho City, for \$22,500. They will run a tunnel which will gain a depth of 300 feet.

The Ingle mill in Charlotte gulch near Grimes Pass, near Idaho City, is in operation. The mill is run by electric power.

CUSTER COUNTY.

The Mackay Telegraph reports the Alto section, a new mining district, being opened up at the headwaters of Lost river, between Mackay and Ketchum. The district shows outcroppings of lead, silver and copper ores, the principal formations being limestone and granite. There is an abundance of timber and water. Ketchum, the nearest shipping point, is 16 miles distant. A. F. McKenna & Co. have men doing development work on the Douglas and Clifton claims.

Operations are progressing at the mines of the Boulder M. Co., near Mackay, says A. B. Fitzgerald. He has men running a crosscut from the bottom of the shaft to the hanging wall and 35 feet of lead and silver ore running \$15 per ton has been cut.

IDAHO COUNTY.

R. E. Davidson, manager of the Concord M. Co., operating the Ajax, Mother Lod and others at Buffalo Hump, is arranging for a steam hoist on the Ajax. The company will increase development work this year.

LEMHI COUNTY.

Manager Lo Slour of the Lo Slour Opal M. Co., operating the opal mines on Panther creek, near Salmon City, says he is putting up lapidary works to turn out the finished product of the mine directly on the ground.

SHOSHONE COUNTY.

D. Leshier is building a twelve-ton cyanide plant near the Mother Lode tailing dump, which he has secured from the Murphy Dev. Co. on tribute. It is estimated there are 200 tons of tailings on the dump.

The North American M. & M. Co., operating a group of eleven claims on Bug creek, east of Wardner, filed articles of incorporation last week; J. Presley, T. and T. Fahey and A. Murphy of Wallace, and A. Fahey of Burke.

The Chicago-Pierce Dev. Co. incorporated last week, principal place of business Pierce City, where a group of claims is being operated. A. G. Arnold, J. L. Dunn, W. Dahl, S. S. Johnson, E. J. Bower are incorporators. W. Dahl of Pierce is manager.

A number of improvements are under way at the Morning mine, at Mullan, including the addition of machinery to the concentrator. A system of ten more jigs have been added to the plant. These treat tailings that were formerly washed into the creek. Ten concentrating tables are also being put in. A vanner house has been built near the mill, which will be equipped with machinery. This will replace the slum tanks on the outside of the mill. A 50 H. P. Corliss engine will be set up in the vanner house, which will supply power for the lower part of the mill when the water power becomes insufficient. The two "high lines" which supply the mill with water power will be entirely rebuilt. There are 2 miles of flume, and this will be reconstructed.

J. L. Dunn and T. Wilkinson of the Wild Rose mine, near Pierce, report their mill operations show the ore to average \$10 a ton. No ore has yet been stoped below the 40-foot level. The mill has a capacity of one and one-half tons daily. The owners have awarded a contract for driving a 350-foot tunnel which will tap the ledge at 110 feet.

G. Turner of Spokane, Wash., is reported to have secured options on the Standard and Mammoth silver-lead mines near Wallace for \$5,000,000.

WASHINGTON COUNTY.

The Ladd Metals Co. has been organized and taken over all the holdings of the Con. C. M. Co., operating at Mineral. C. E. Ladd of Portland, Or., is president; W. H. Adams of New York, managing director, and B. L. Stayner of Portland, Or., manager. The company has bought the Iron Dyke copper mine in Oregon, across the Snake river from the Seven Devils district. Work began this week on the erection of a smelter at that point. The smelter will be of seventy-five tons capacity at first. The nearest railroad is Nagle, near Huntington, a distance of 50 miles. In this smelter it is said will be introduced a furnace which is heated by gas formed from pulverized slack coal. This gas is forced by jet into the furnace under the reverberatory.

MICHIGAN.

Although ore shipments by lake began two weeks later this year than in 1902, the movement to June 1st amounted to 3,000,000 tons, an increase of 150,000 tons over 1902.

The increase in the May product from the Copper Range Con. mines, near Painesdale, was more than expected, and their combined output was 1000 tons of refined copper. Some improvements are under way at the Baltic mill, which is operating all four stamps, as a result of which it is intended the capacity will be increased. The contents of the refined copper in the rock stamped during May was twenty-three pounds per ton, as compared with twenty pounds for April. The Champion is operating three stamps, not to full capacity, and no further increase seems likely until the 100-drill compressor is in operation, when the daily rock shipments will aggregate 2000 tons.

Houghton County.

The May output of the Franklin mine, near Hancock, aggregated 460,000 pounds of copper. The fourth head of Franklin stamps will be ready in October. Three heads now in use are stamping 1100 tons of rock daily.

The Osceola mine, near Calumet, produced during May 611 tons of refined copper. The volume of rock forwarded to the mill during the early portion of the month was only sufficient to supply three stamps, while the average for the entire period would keep five heads running steadily. There has been a constant increase in the volume of rock forwarded from the Kearsarge shafts. The bottom levels north of No. 3 shaft are reported

opening into good ground. No. 1 North Kearsarge is again in operation, having been enlarged to a three compartment shaft. The compressor at this shaft has been set up.

The product of the Quincy mine at Hancock for the past year was 19,000,000 pounds, secured at a cost, including construction charges, of 9 1/2 cents per pound. Construction cost equalled 1/2 cent per pound on the product, and with the reduced charges in this and other directions the current year's cost is not expected to exceed 9 cents per pound.

The No. 2 shaft at the Tamarack mine, near Calumet, was shut down last week to undergo repairs. The rock shipments during May show a decrease.

KEWEENAW COUNTY.

No. 4 shaft at the Mohawk mine, near Allouez, is being prepared as a producer. Foundations for the shaft and engine houses are ready for the structural iron.

The Ahmeek mine, near Allouez, has struck the Kearsarge amygdaloid lode in the crosscut run west. The crosscut was in a copper-bearing rock on the footwall for 20 feet before striking the main lode. It is reported that a consolidation of the Ahmeek and the Seneca is proposed.

ONTONAGON COUNTY.

The junction of the Branch vein and the Minnesota lode in the Michigan mine, near Mass City, was struck in the winze from the twelfth level to the crosscut from the Calico lode. Superintendent Brady says the lode shows heavy mass copper. The lower crosscut has 120 feet to go before striking it, and will prove the nature of the ground below the contact.

MINNESOTA.

SAINT LOUIS COUNTY.

D. M. Philbin, assistant general superintendent of the Great Northern road, will close his option for the mining lease on the Flynn Iron mine, near Hibbing. The eighty acres are owned by the State, and the owners of the lease are A. M. Chisholm and J. C. Flynn of Duluth and D. C. Rood of Hibbing, and the terms of the option held by Philbin are to pay a bonus of \$40,000 and 35 cents royalty. The minimum of ore to be mined annually on which royalty must be paid is 100,000 tons. The State royalty is 25 cents. The ore deposit is 165 feet in depth.

MONTANA.

BEAVERHEAD COUNTY.

P. M. Sweeney, owning a group of graphite prospects near the range between Lodge and Sheep Creek valleys, near Dillon, says development work will be done. Assays show 16% of graphite. The formation is a contact of lime and quartzite and the veins are 10 feet wide.

CHOTEAU COUNTY.

Superintendent W. M. McClean, putting in a cyanide mill on the E. W. King group, in the Little Rockies, near Landusky, says the framework of the mill is completed and the machinery is expected to be in operation by the first of July.

The Mission Peak M. Co. have started their stamp mill again, after lying idle all winter.

FLATHEAD COUNTY.

G. E. Shawler, manager of the Mustang Con. M. Co., reports suspending operations temporarily on account of the water in the tunnel. About 200 feet of work has been done on the Alabama claim by this company during the winter.

The American Kootenai M. Co. started up its stamp mill in West Fisher district, near Libby, last week. S. J. Morris is manager. There are twenty-five men at work in the mine and mill. The American Kootenai owns a group of claims on Blacktail mountain. These have been developed by a series of tunnels run at intervals along the course of the veins. The mill is 2400 feet down the side of the mountain from the claims and is connected with the mine workings by a bucket tram. The mill is run by water power. The ore values are in gold.

H. Hildebrandt of Cabinet reports having men at work on the Standard claims in West Fisher district, near Cabinet. The 800-foot tunnel will be driven ahead, and if the ledge is tapped as expected a mill will be built next season.

GRANITE COUNTY.

P. S. Mussighrod of Garnet reports a strike of free gold ore on one of his claims adjoining the Fairview mine. The vein was struck 60 feet from the surface. It is 4 feet wide and average assays yield \$26 per ton. He will start his mill if the lead holds out. The tunnel in which the strike was made is 200 yards from the mill.

The New York company that bonded the Copper State & Red Metal group near Stone will take up the bond and further develop them. A lead was cut last week which assays 12% copper. A number of

other claims are being developed in the same district.

In Red Lion district the Barton & Jones group, at the head of Warm Springs, has been bonded to the Montana M. Co. of Marysville, owners of the Drumlunnon mine, for \$40,000. The lead is 34 feet wide, with free-milling ore averaging \$5 per ton. Fifty feet from the main shaft on the Barton & Jones group is a parallel vein 2 feet wide, the ore running \$40 per ton.

Healy & Sheehan, who are working the Luxemburg mine, near Phillipsburg, have struck a pay streak 20 inches wide in their main vein, which runs well in gold. They have leased the Glenn mill and will run it on Luxemburg ores. The Gold Coin mine, in the same district, will be started up after an extended idleness.

JEFFERSON COUNTY.

Manager Hewett of the Cataract M. Co., which owns a number of properties in Cataract district, near Basin, has men at work preparing the site for the 200-ton smelter. The smelter will be on Jack creek, near the Cataract mines.—Regular shipments are being made from the Silversmith mine, in Basin district, the ore running \$150 per ton.—Kidney & Bay have a lease and bond on the Comstock mine, in Basin district, and will put in machinery and sink the shaft deeper.

LEWIS AND CLARKE COUNTY.

The Capitol Con. M. Co. of Helena report making a strike in their mine in Holmes gulch, 3 miles from Helena, and will put on more men and begin shipping. The strike is a contact vein, having 3 feet of shipping ore. The old workings in the mine were abandoned when 6 inches further work would have struck this vein.

MADISON COUNTY.

The Pacific mine, near Virginia City, has men at work and is running the mill one shift. It will be worked on full time as soon as the water supply increases. The Msphton mine made a shipment last week, says the Intermountain, of two cars of ore which run \$40 per ton.

The Speculator M. Co., near Pony, had surveyors at work last week on the Fourth of July ground, laying out a site for a mill. The company has temporarily suspended work on the Mammoth side of the hill.

Superintendent Carson has six six-horse teams steadily hauling ore from the Clipper mine to the N. P. Railway depot at Pony. These teams make two trips per day, bringing down seven tons to the load, a total of eighty-four tons per day. The ore averages \$20 per ton in gold. There are forty miners at work at the Clipper. It is expected work will be resumed on the tramway from the mine to the mill at Pony during the summer.

The sale of the Proctor Knott group to the Con. Copper Co. of Minneapolis, Minn., for \$50,000, is reported. The group consists of three full claims, 3 miles from Pony, and near the Clipper-Boss Tweed group, the Bozeman and others. The Proctor Knott has been developed to depth of 300 feet.

PARK COUNTY.

W. E. Stevens of Spokane, Wash., has a fifty-year lease on two copper properties near Springdale, being the Rambler and Mascott mines. Machinery will be put in and work started by July 1. They will be operated on a royalty basis.

TETON COUNTY.

At Dupuyer the Josephine C. M. & S. Co. has been incorporated to develop the Josephine and other mines near Dupuyer.

NEVADA.

EUREKA COUNTY.

The Tybo M. & R. Co. has preliminary work under way for improvements to be made in and around the mine and for resuming ore shipments. Additional machinery and mining supplies are on the ground. In addition to the Tybo output this company will handle the Revell ore.

R. S. McCaffery, manager of the Grand Deposit group of mines on Muncie creek, 12 miles from Aurum, says a boiler, hoist, a compressor and power drills are to be put in. Sinking to depth of 600 feet will begin this month.—At Aurum, Slegel Bros. of Salt Lake City, Utah, are increasing development work on the group of mines on which they have a bond. They are shipping ores that yield 100 ounces silver per ton. There is also manganese in the gangue, making a desirable flux.

HUMBOLDT COUNTY.

(Special Correspondence.)—The Sheba G. & S. M. Co. have put in an air compressor and are driving their lower tunnel on the Sheba cut to the contact. They are in 450 feet, with 400 feet more to drive, which will bring them 275 feet below the lowest workings, or a total depth of 400 feet. On their Mammoth group, farther up the canyon and west of the Sheba,

Superintendent J. T. Kessel has a tunnel in 185 feet, with 100 feet more to drive to cut the ore bodies at depth of 250 feet from surface. The company's ground covers a total of thirty-one claims in the Star mining district, 14 miles south of Mill City on the Central Pacific Railroad. There is a shaft and two levels opened from it, with 2000 feet of tunnels and drifts on the Sheba. The compressor plant and the mill of fifty tons capacity are both run by water power. W. N. Child of Salt Lake City, Utah, is secretary and treasurer. — Mill City, June 17.

LINCOLN COUNTY.

The Ione M. Co. has been organized at Los Angeles, Cal., and will operate in Searchlight. They own the six claims of the D. E. Miess Pompeian group and will also work two claims owned by Okey, Colton & Parsons, all of which are north of the Blossom group.

NYE COUNTY.

The merging of a number of mining companies, embracing several southeastern groups of Tonopah, have been completed, including the Fraction, Gold Hill, Salt Lake and Tonopah City companies. The Tonopah City ground adjoins the Fraction on the south, Salt Lake and Gold Hill on the west and New York Tonopah on the east. J. L. Butler, T. L. Oddie, W. and H. C. Brougher, U. B. Curtis, A. J. Crocker, W. J. Sinclair, J. Salsberry, W. Sperry, J. P. Hennessy and J. W. McCulloch are interested.

G. R. Duncan, D. S. Cohn, J. Ennis, J. H. Miles and C. Cohn have organized the Atwood M. & D. Co., to operate a group of eight claims northeast of the Sierra Vista Co. ground at Atwood. One of the claims will be reserved for townsite purposes, as on it are three springs. The other claims show ledges carrying gold, silver and copper.

The Tonopah-Kansas City Co., organized to develop the Northwestern, a group of claims northwest of the Hasbrouck, in Gold Mountain belt, near Tonopah, has the Clipper Bullion group and the Fraction claim. This gives them an east and west length of 4500 feet on the extension of the Gold Mountain veins, says C. K. Jarvis, secretary. Kansas City and Memphis capital is interested.

Taylor Bros. have bought a group of six claims on the east slope of Gold mountain, near Tonopah.

M. H. Seeley has bought the C. D. Wilson and C. A. Scheucks group of six claims, west of the General Thomas, in Lone Mountain district, near Tonopah.

T. G. Elgie, J. W. Douglass and W. J. Stoneham have bought a group of seven claims 1½ mile from Barrel Springs and 2 miles from the O'Meara-Lynch group at Alpine for \$6000. An 8-foot ledge showing assays of \$72 in silver and lead has been opened up on one of the claims.

The Tokop group, 60 miles south of Tonopah, have been bonded to J. Kelly of Bodie for \$100,000. The group consists of sixteen claims and the ledges, which outcrop to a height of 15 feet above the surface, carry gold values.

STOREY COUNTY.

A 30 H. P. electric motor and air compressor will be put in at the Caledonia mine on the Comstock lode, near Virginia City.

WASHOE COUNTY.

At the Desert King mine at Wedekind, near Reno, the vein has been opened 50 feet and carries 7 feet of ore having a value of \$33 in gold and 70 ounces in silver per ton. There are 200 tons of this ore on the dump and developments continue. E. Holman is manager of the Desert King and Wedekind mines.

The Con. Nevada Co., sinking on the Anna Bell mine, adjoining the Wedekind, is nearing the contact. At a depth of 170 feet the bottom of the shaft is in altered andesite, showing quartz stringers.

WHITE PINE COUNTY.

W. C. Rose & Co., who have an option and working lease on the Pine Nut silver mine, near Cherry Creek, report making shipments of high-grade black sulphide ore.

NEW MEXICO.

LINCOLN COUNTY.

The American Placer Co. at Jicarilla is overhauling and improving its plant, which has a capacity of 60 tons per hour. Water is plentiful.

J. H. Hinton will add another jig to his plant at Jicarilla, giving it 120 tons daily capacity. The jigs are used to separate the gold from the placer dirt in Juana gulch.—W. A. McIvers is opening an iron mine on Jack mountain, 4 miles northeast of Jicarilla.—F. A. Richardson, of Colorado, has resumed work on the Belle of Mexico and the Belle of Memphis mines at Jicarilla, the latter showing free gold.—The Hawkeye mine at Jicarilla has been sold for \$10,000.

TAOS COUNTY.

The controlling interest in the Paxton mine on Copper mountain, near Taos, has been sold to A. J. James, J. W. Sharp and S. Fromhold, who have begun operations.

Last week, the Jay Hawk mill at Red River resumed operations. The mill has been overhauled and repairs made. Ore is hauled to the mill from the Jay Hawk mine.

OREGON.

BAKER COUNTY.

It is reported the Northwest railway, from Huntington down the Oregon side of the Snake river, will be completed at least a part of this distance to the Iron Dike mine this year. A party of surveyors is in the field near Ox Bow, looking for a site for a 300-ton smelter for the Ladd S. & R. Co., says Manager C. E. Ladd of Portland. Ore will be furnished by the Cornucopia, Mineral, Iron Dike and Seven Devils districts. The surveyors are also looking into the project of tunneling Ox Bow for water power, taking water from Snake river.

E. J. Godfrey, of the Red Boy mine, near Sumpter, says the second ten stamps of their 20-stamp mill have resumed dropping.

W. W. Robbins, of the South Pole Con. G. M. Co., near Sumpter, says work has resumed in No. 1 tunnel. No. 1 is in 250 feet from the face of the vein. Before abandoning the level last winter a cross-cut was run 45 feet without striking the hanging wall. Work has resumed at this point. A winze will also be sunk from this to No. 2, and in addition a stope started to follow up an ore shoot showing values. There is another vein, 80 feet west of the No. 1 level, showing good surface values.

J. Thomsen, superintendent of the May Queen mine, near Sumpter, says he has drifted 120 feet on the ledge and has 3 feet of good milling ore. Six inches of the vein shows average values of \$30. More men have been put on. The 10-stamp mill will be started up next week for testing the ore, and Thomsen is getting in a supply of wood to begin running steadily by next fall.

Mill operations are again under way at the Psyche mine near Sumpter, says Superintendent Elmer, and twenty stamps are dropping.

President Hayes of the Beaver M. Co., owning holdings on the Elkhorn divide, near Baker City, says they propose to drive the crosscut tunnel and build a water power and electric transmission plant for their Balsley-Elkhorn mine. This tunnel, to open the Balsley-Elkhorn and other adjacent properties at depth, will be 5000 feet long. They have 8000 feet of air pipe and a 16-drill compressor on the ground.

A developing plant is to be put in on the Last Chance group in Cable Cove, near Sumpter, says Manager L. G. Lilley, who is in charge of the properties of the Baby McKee Con. Co.

Operations were resumed last week at the Imperial mine, near Sumpter, says Superintendent Paul. It is intended to sink the shaft and begin breaking down ore at the same time.—Construction work is again under way on the concentrator of the California mine, says Manager Bellman. The aerial tramway will be hauling ore to the mill as soon as the terminal bins are finished.

The Gold Reserve M. Co., of which F. W. Hilscher is president, has bought the Manhattan claim near Sumpter, in Bonanza district, near the Snowstorm and the Gold Ridge mines. Free gold is carried in the ore.

GRANT COUNTY.

The 5-stamp Isham Lawrence mill at Quartzburg is being repaired and additional machinery put in, says Manager J. W. Hughes, of the Equity Co., which owns the group.

JACKSON COUNTY.

J. A. Whitman and J. D. Heard of Ashland have begun operations on a group of placer claims on Steve's Fork of Steamboat lake, near Steamboat, comprising 880 acres of mining ground. They have twenty men at work and expect to be piling by July 15th. The water supply is sufficient to run the year round, except a few weeks in the winter when the water may freeze in the ditch. Later a 3-mile ditch will be built to cover their whole area.

JOSEPHINE COUNTY.

At the Gopher quartz mine, in Jump-off-Joe district, near Grant's Pass, men are at work crosscutting the ledge and taking out ore. The Gopher has a small stamp mill.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Le Roy M. & M. Co. has been organized to operate near Custer. Its

main office is in Minneapolis, Minn., and F. H. Cook, C. C. Looney, A. Q. Miller are the officers, with J. H. Sinclair of Denver, Colo., as manager. They own 185 acres of ground on French creek, near the Roosevelt group, Minnie May and Mayflower mines. The ore is principally quartz. The plans of the company are to put up a hoisting plant and develop the ground, beginning operations this week.

The Golden Crest mine, near Deadwood, has closed down its mill and is preparing to double its capacity.

The Ruby G. M. Co. has bought a mill site at Galena, a mile from its mine. There is plenty of water there also, and as it is considerably lower than the mine, the expense of transporting the ore will be low. A wire rope tramway will be put up for this purpose.

The Golden Reward Co. is running full capacity of 220 tons of ore per day in its cyanide plant at Deadwood, and is also shipping out smelting ore. Further development work has been done on the surface shoots of this company's property, the grade being lower than that heretofore found in the main levels, says H. Franklin, manager.

Fire destroyed the cyanide mill at Pluma, owned by New York men, on the 13th inst. Loss \$10,000. The plant was operating on Homestake tailings.

UTAH.

BEAVER COUNTY.

The Burning Moscow and Wild Bill mines, near Milford, are reported sold to the Royal M. Co. for \$150,000, and initial payment made by A. B. Lewis, president. Both mines carry ores with values in silver, gold, lead and copper.

IRON COUNTY.

W. H. Webber, manager of the Rambler mine at Grand Encampment, Wyo., says he will begin operations at the Hope group of mines at Stateline, which he has under bond.

JUAB COUNTY.

The management of the Star Con. M. Co. at Eureka are marketing ore on controls showing \$38 in gold, with 4.6 ounces silver per ton. With timbers on the ground, after many delays, Manager Packard says he will begin stoping on the 300-foot level, and expects to get out six cars a week hereafter. It has also been decided to resume work in the copper-bearing vein, as two parties have made the management offers to do it under lease.

With its waters under control, sinking the shaft on the South Swansea mine at Silver City was resumed last week, to continue down to the 950-foot level, where it is expected to still be in the vein. Meanwhile the Swansea is ready to resume, and, recovering its 600-gallon tank which was "drowned" some months ago, will begin raising water, says Manager Geddes.

Ore is being broken in the Star Con. mine at Eureka on the 300-foot level at rate of a car a day. Superintendent Packard has started a 20-foot raise from the 400-foot level to connect with the ore body opened by the Finn leasers. He has also started a raise from the 400 on a body of low-grade silver-lead ore.

PIUTE COUNTY.

(Special Correspondence.)—The L. & N. on Mt. Baldy gold belt, near Marysville, has been bonded to S. F. Mount of Richfield for \$50,000. Shipping ore is in sight and shipments will be made as soon as work gets under way.—At the B. W. & H. on Sevier river the tunnel conditions continue as usual. The fissure in which the lower tunnel is being run carries shipping ore.

The J. M. location on the west side has opened up a 20-foot vein of ore, which carries average values of thirty-two ounces silver and \$8 gold per ton.—The Belnap M. Co., down Sevier canyon at depth of 20 feet, has opened a vein 4 feet in width, averaging \$20 per ton in gold. W. S. Kennedy is president.

Kimball & Turner propose to build a stamp mill on their Gold mountain holdings, near Marysville. The ore runs \$15 in gold per ton.—Superintendent O. Larsen at the Snow Bird mine began operations this week.—G. Romney, Jr., and G. F. Dalton of Salt Lake City have made arrangements to erect buildings and begin permanent work on their group near Marysville.—F. M. Haughey intends to begin work on the 16 to 1 group. This property has a body of milling ore.—R. Dewitt of 10-mile reports the outlook encouraging in that section.—L. H. Bartholomew, president of the Copper Belt M. Co., is making arrangements to start the tunnel as soon as the material arrives. Marysville, June 16.

SALT LAKE COUNTY.

Manager E. W. Young of the Mystic Shrine mine near mouth of Markham gulch, near Bingham, says the main tunnel, following a fissure, is in 600 feet and is expected to cut the contact vein at 800

feet. Owing to bad air, but one shift a day is made, and a blow is being put in. A crosscut started west at 250 feet from mouth of main tunnel has been advanced 400 feet, and there an upraise is being made on a parallel fissure. In the Tin-horn (upper) incline there is a showing of 3 feet of pyritic ore that assays show to be smelting grade, carrying copper, lead, silver and gold.

Under a franchise obtained by the Highland Boy Con. of Bingham from the Yampa, the former is driving for its Leonard ledge, in which territory it has 700 feet along its strike. To tap this vein a drift was started from the 1500-foot station of the Craig tunnel and running through Andy ground; the management of the Highland Boy Con. expects to make connection with the ore body at a point 150 feet distant. W. R. Smith is superintendent.

The Columbus Con. M. Co., operating at Alta, has filed a notice to the effect that it has appropriated a portion of the waters of Little Cottonwood creek, which it proposes to divert from that stream through a pipe line 1 mile long, beginning at a point 4 miles above Wasatch, for supplying energy to two 5-foot impulse wheels. This is one move toward building a concentrator at the Columbus, which will be operated by electricity, generated from this source. The plant will be in Little Cottonwood canyon, 2 miles below the mine.

The Bingham West Dip Tunnel Co., whose mines are on the west slope of the Oquirrh range of mountains, near Bingham, are reported to be making arrangements to drive a tunnel directly through the ore-bearing range of Bingham, cross-cutting all the mineral veins on its course and later to extract the ore therefrom; also to develop the ore bodies on its own properties and to utilize its water, which will be increased by the drainage from the tunnel, for power and milling purposes. Men are at work and the tunnel has reached the length of 160 feet. The company owns 500 acres of mining claims, a reservoir and millsite. J. A. Silver of Salt Lake City is president.

With the consolidation perfected, the Butler-Liberal mines at Bingham will start up by July 1. It is intended to do considerable development work on the Snow Bird, the east claim of the Ben Butler group.

The Old Telegraph mine, at Bingham, has taken on more men since the temporary shut-down and has ninety men on the payroll.

The United States tramway at Bingham having been readjusted and strengthened, is transporting 500 tons of ore daily (filling the smelter's present demands on the Bingham mines), and is said to have a daily capacity of 1500 tons.

The Utah Apex Co., operating on the New York and Copperfield groups at Bingham, has incorporated. The organizers are E. W. Hastings, J. W. Horne, E. B. Webster and W. J. Carlin of Boston, Mass., and A. J. Orem of Salt Lake City. Manager Orem says developments have shown ore carrying values in lead, silver and gold, along with the ferro-sulphides carrying copper, gold and silver. The company has bought the Minnie, Eda and other adjacent locations.

The development plant of the New State M. Co., between the Cottonwood canyons, near Alta, is in operation, says Manager J. Dederichs. The shaft, which is at the mouth of the tunnel, will be sunk to depth of 3000 feet, from which point a crosscut will be driven to the ledge which has been opened up in the tunnel, showing 18 inches of gold-bearing copper ore.

The Highland Boy mines at Bingham, its smelter in Salt Lake valley and the entire holdings and rights of the Utah Con. G. M. Co. of England have been transferred to the Utah Con. M. Co. of New Jersey, and Manager R. H. Channing retained as manager for the new company. Although the Highland Boy mine has been owned by the Utah Con. for some time, it has continued under its original name.

SUMMIT COUNTY.

For crosscutting the country and ultimately connecting with the main workings of the Daly-Judge extending west along the mineral-bearing zone at Park City, the management of the Great Western M. Co. is preparing to drive from 1500 to 2000 feet, this avenue to be connected with the Judge's McSorley drift by an upraise from the latter, says the Salt Lake Tribune. Manager D. Evans reports other development work progressing.

TOOELE COUNTY.

The battery of retorts by which the quicksilver ores of the Sacramento mines of Mercur are to be reduced was fired up last week, says Superintendent McGee.

WASHINGTON.

FERRY COUNTY.

Operations in Meteor camp on the Col-

ville reservation are progressing. The Stray Dog mine, of which C. B. Olmstead is manager, is putting in a hoist and will stop ore from the 300-foot level. The Nonpareil, in which H. G. Brown of Spokane is interested, is planning to increase development. Manager W. I. Reddin of the Meteor group says Superintendent A. Wilson has men at work. The tunnel is in 60 feet. The White Swan will start next week.

STEVENS COUNTY.

H. Ranahan and W. Townsend report making a strike last week on the Copper King group, on Toulou mountain, 14 miles west of Bossburg. Twenty feet of copper ore were opened between granite and porphyry. The ore showed some gold values also. The Copper King is 1 mile south of the Orient group.

WISCONSIN.

DOUGLAS COUNTY.

The shaft at the Weyerhaeuser copper mine is down 212 feet. Considerable drifting and crosscutting is being done and the shaft will be continued deeper. The lode is wide and copper values are scattered as yet.

WYOMING.

CARBON COUNTY.

At Grand Encampment the aerial tramway is delivering ore at the bins at the terminal at the North American C. Co. It is expected the smelter will be blown in this week on sulphide ore from the Ferris-Haggarty mine.

FOREIGN.

AFRICA.

RHODESIA.

The Chamber of Mines at Bulawayo report the gold production of Rhodesia for 1902 amounted to 201,079 ounces, against 180,888 ounces in 1901. President Heyman deprecated the employment of white labor in the mines. The Portuguese government, he said, was doing its best to prevent Shangaas from proceeding to Rhodesia, and there was little hope at present of labor from Central Africa. On the other hand, only 12% of the natives working in Rhodesian mines were recruited locally. One thousand and fifty stamps have been ordered, but they could not be erected unless a sufficient supply of labor were assured. In deference to public opinion, the Chamber has decided to try Indians, but if these proved unsatisfactory they will have to go to China for laborers.

TRANSVAAL.

April returns for Transvaal mines show:

	Stamps.	Tons Milled.	Yield, Fine Ozs.
Witwatersrand—			
Crown Deep.....	135	18,725	6,977
Driefontein Con....	110	12,261	6,498
Durban Roodepoort..	70	8,500	4,995
Goldenhuis Deep....	160	20,700	8,952
Glen Deep.....	80	11,500	4,479
Jumpers Deep.....	90	14,901	5,901
Langlaagte Deep....	85	17,477	4,107
Nourse Deep.....	75	10,740	4,823
Robinson Deep.....	120	16,968	8,636
Rose Deep.....	110	17,614	6,462
Village Main Reef..	100	13,000	6,759
Nineteen other mines,			
total of.....	850	109,586	53,984
Outside Districts—			
Three mines, total of	70	9,522	5,003

This shows a net increase over March for thirty Rand and three outside mines of 130 stamps, and a net increase in output of 5798 ounces.

AUSTRALIA.

The Australasian gold production for the first quarter of 1903 is given as follows by the Australian Mining Standard:

State or Colony.	Fine oz. 1902.	Fine oz. 1903.
Western Australia.....	428,229	506,447
Victoria.....	151,427	169,837
Queensland.....	127,412	148,412
New Zealand.....	88,677	105,897
New South Wales.....	66,513	32,748

Total.....	862,258	963,431
Net increase for 1903..		101,173

NEW SOUTH WALES.

The total value of the minerals exported from New South Wales for the first quarter of 1903 was \$844,127, but it included copper and tin, valued at \$25,000, refined in the State from imported ore. Exports of coal were valued at \$412,000; silver, \$18,401; silver-lead concentrates and ore, \$284,194; copper, \$78,000; tin, \$51,499.

The gold obtained by dredging in New South Wales amounted to 25,473 ounces, valued at \$97,891, an increase of 1838 ounces compared with the yield for 1901. This output was from twenty-two bucket and seven suction dredges. Of these, 52% were operating in Araluen division. In the Stanthorpe district, there were three

dredges working for tin, and two others in the course of construction, while one other plant was equipped to save tin as well as gold.

The total gold yield for New South Wales for April, 1903, amounted to 31,200 fine ounces, making a total of 63,948 ounces since January 1.

QUEENSLAND.

The total gold yield of Queensland for the month of April was 67,193 crude ounces, or 369 ounces more than for April, 1902. For the first four months of 1903 the output has been 271,148 ounces—an increase of 29,748 ounces compared with the same period of 1902.

The tin output reported from Ingham for the first quarter of 1903 was 34 tons of stream tin, valued at £2890, and 41 tons of black tin, valued at £2788. Of this quantity 34 tons were from the Waverley company. The average number of men employed by the Waverley company is fifty. During the past quarter the company raised 933 tons of ore and crushed 990 tons. They also treated 115 tons of ore from the Freehold Tin M. Co., yielding 7 tons 6 cwt. of tin.

At Bundaberg the Mount Perry Copper Co., under the management of A. Gibb, are increasing their output. They have bought several additional mines in the district, including the Great Freehold, which alone will keep 200 men at work. The monthly shipments of copper matte through Bundaberg are increasing.

WEST AUSTRALIA.

Webster's Find battery at Malcolm, in North Coolgardie district, is in operation, and it is estimated there is enough ore in sight to keep the mill running six months. The reef averages 4 feet wide and runs half an ounce gold per ton. Development work will be increased.

A cyanide plant has been built on the Empress mine at Mount Magnet.

The enlarged mill of 20 stamps at the Hainault mine is in full operation, making an output of 2000 tons per month.

BRITISH COLUMBIA.

The Nellie Cotton and Mystic mines, near Phoenix in Greenwood camp, have been sold to J. E. and W. D. Everhart and M. Sands of Chicago, Ill., and first payment of \$10,000 made. The group adjoins the Ironsides and the Knob Hill mines, and the ore is gold and copper, with some silver.

Operations have resumed on the Athelstan mine of Wellington camp, 3 miles from Phoenix. Superintendent D. Oxley has put on more men and ore will be taken out. The Athelstan is owned by the Athelstan G. & C. M. Co., Ltd. J. Anderson is president.

The Kettle River mine in Kettle River district, owned by the Kettle River M., L. & P. Co., and composed of Spokane men, will be opened up this month. The company has been getting out lumber from their sawmill and a high water bridge has been built across the Kettle river to the railroad siding. There is a great deal of ore on the dump at the mine and this can be hauled across the new bridge for transportation to the smelter. The values in the mine are mostly in silver and lead, with some gold. The work to be started will consist of a shaft sunk on the ledge.

Manager Tonkin of the Crow's Nest Pass Coal Co., Ltd., in outlining the company's plans to further develop and increase the output of the coal mines at Morrissey, says a tail rope haulage engine will be put in at the head of the incline, above the tippie, for hauling empty and loaded cars. Track scales will be placed at the head of the incline for weighing cars of coal as they come out from the mine to determine the number of tons on which miners are to be paid. A tunnel will be run in an entirely new body of coal, known as No. 2 vein, which has not yet been worked. Two hundred additional mine cars will be used; ten horses are to be used to haul cars out of the tunnels. An exhaust fan, 18 feet in diameter, will be set up to ventilate No. 2 and No. 3 tunnels. The engine to run this fan is already on the ground. The contract has been let to drive a long crosscut to connect No. 2 and No. 3 tunnels.

White Bear shareholders' meeting at Toronto is reported to have decided to put in machinery at the White Bear mine, near Rossland, including a 20-drill compressor and a 125 H. P. hoist, with apparatus for the framing shed. Work will begin on the new head works. It is expected that sinking will be resumed at the White Bear. The main drift on the 850-foot level is being extended, but when the ore bodies for which the drift is headed are cut it is intended to cease work on that level and sink 100 feet, where another level will be driven.

For the third consecutive week the Snowshoe mine, near Phoenix, sent out 1680 tons of ore for the week ending June

6th. It has begun shipments, however, at the rate of 330 tons (11 cars) per day, or about 2300 tons per week.—The Big Copper and King Solomon mines in Copper camp are expected to begin shipping as soon as the C. P. R. spur is extended from the Mother Lode to the Morrison. There will be a wagon haul of 3 miles.

On completion of the 250 coke ovens in course of construction at the coal mines at Morrissey, work on 500 additional ovens will be started.

At Rossland the Spitzee mine's new head works are completed. At the White Bear arrangements are being made to sink to the 950-foot level.

At Lillooet, on the Fraser river, the Iowa M. Co. are putting in the first of eight dredges on a stretch of 3 miles of the river. J. Ames is superintending engineer. The dredge will have a daily capacity of 4000 cubic yards. Its cost, with equipment, is stated to be \$95,000. The company will make a special feature of saving the platinum, which exists in the black sands of the district.

The South Valley mine, on Howe Sound, 23 miles from Vancouver, has been sold to a London and Paris company. The group is on the south side of Britannia mountain, over the divide from the Britannia mine. J. F. Humphries of Philadelphia, Pa., former half owner in the claims, still retains an interest. The price was \$250,000 in cash, besides stock. Development work has begun.

The Tyee C. Co. at Ladysmith report to the head office at London, England, for May, shows 4260 tons of ore. The company ships its matte and the receipts for May were \$63,500.

The Stevedyke Partnership, near Atlin, have the season's operations under way and are building a flume, 4500 feet, from Pine to bring water for this year's prospect work.

Work is under way on Texada Island by a Tacoma, Wash., company, operating the Loyal mine, with Superintendent Denny in charge. H. W. Treat, manager of the Van Anda C. & G. Co., is in charge.

N. F. McNaught of Silverton, owner of the Hampton group, at the head of Springer creek, states that he will start work as early as the snow will permit.

MEXICO.

SAN LUIS POTOSI.

The Metallurgical Co. of Matehuala has selected the site for their smelter and construction will begin this month. It is intended to build three copper and two lead furnaces, representing a daily capacity of 500 tons. The cost of the plant is estimated at \$1,000,000.

Catalogues Received.

The Eugene Dietzgen Co. of 181 Monroe street, Chicago, has issued a supplemental catalogue for 1903 descriptive of their large line of Richter's instruments of precision, a class of instruments absolutely essential to correct draughting.

The J. Geo. Leyner Engineering Works Co. of Denver, Colo., have issued their catalogue for 1903. It is nicely illustrated, showing the Leyner drill and its method of working under ground and in quarries under the varying conditions found in practice. This catalogue cannot fail to be of interest to all users of power drills.

The C. O. Bartlett & Snow Co. of Cleveland, O., have issued Catalogue No. 8 on paint machinery. It is profusely illustrated and shows the various types of paint grinding and mixing machines, tanks, etc., and gives much valuable and interesting information on the subject of pigments and their preparation for the market.

The Westinghouse Electric & Manufacturing Co. of Pittsburgh, Pa., have issued an attractive pamphlet entitled "Electricity in Mining," being one of the industrial series of publications issued by them. It is handsomely illustrated and shows various types of dynamos, motors and electric engines employed in mining work. It deals with transportation, hoisting, pumping, ventilating, air compression, coal cutting and other phases of mining to which electric machinery has been adapted.

THE Goheen Manufacturing Co. of Canton, O., have issued an interesting and profusely illustrated catalogue showing the manifold uses to which their carbonizing coating is put. Steel buildings, pipe lines, industrial plants, stacks, bridges, mills, tanks and other metallic structures are protected, they claim, from the effects of dampness, acid fumes, smoke or other injurious attack. The illustrations in this pamphlet are interesting and show a variety of structures of steel, which have been protected by their carbonizing coating.

PERSONAL.

L. W. FELT has resigned as manager of the Model G. M. Co. at McCabe, Ariz.

E. A. DE HAVEN of Los Angeles, Cal., is in San Francisco, Cal., on mining business.

H. H. SCALES of Truckee, Cal., interested in Nevada mines, is in San Francisco, Cal.

G. PARO is superintendent of the Johnny Bull mine, near Rico, Dolores county, Colo.

E. C. VOORHIES, superintendent of the Lincoln mine, Sutter Creek, Cal., is in San Francisco, Cal.

S. I. MARCUM, a mining engineer of London, England, is examining mines in Northern Sonora, Mexico.

B. M. TAYLOR of the Zella and Argonaut mines, Jackson, Cal., is in San Francisco, Cal., on his way East.

J. B. EMPSON, of Deadwood, South Dakota, has been examining tin mines at Nigger Hill, near Tinton, S. D.

J. FARREL is superintendent of the McCabe mine of the Model G. M. Co. at McCabe, Yavapai county, Ariz.

J. H. STRITE, of Santa Cruz, Cal., has gone to Woldsky, Alaska, to put up a stamp mill for the Olympic M. Co.

H. F. BROWN, E. M., of San Francisco, Cal., has gone to the Okanogan country, British Columbia, to make mine examinations.

J. JACOBS of Colorado Springs, Colo., is superintendent of the Sultana mine, near Angels, Cal., vice A. Chalmers, resigned.

W. J. BEAGER, on account of poor health, has resigned as manager of the American Kootenai M. Co., operating near Libby, Mont.

S. J. MORRIS is manager of the American Kootenai M. Co., operating in West Fisher district, near Libby, Mont., vice W. J. Beager, resigned.

A. VAN DER NAILLEN, JR., manager of the Van der Nailen School of Engineering of San Francisco, Cal., is in Seattle, Wash., on business.

P. ARGALL of Denver, Colo., and C. W. Purlington of Doveton & Purlington left Denver, June 15, for a short professional trip to Nevada and Idaho.

P. MORGAN, formerly with the Utica M. Co. at Angels, Cal., is superintendent of the Mount Pleasant mine, near Grizzly Flat, El Dorado county, Cal.

W. S. TARBELL, business manager of the Mining Investor of Colorado Springs, Colo., has returned from a trip to Tonopah, Nev., and San Francisco, Cal.

R. B. TAYLOR, formerly of South Riverside, Cal., leaves July 1st for Antioquia, Colombia, South America, where he is interested in a group of placer mines.

J. EDDIE has resigned as superintendent of the Gold Tunnel mine, near Grass Valley, Cal., to accept a similar position at the Zehright mine in same district.

C. G. SCHREIBER is manager of the Model G. M. Co. at McCabe, Yavapai county, Ariz., operating the McCabe and Model mines, vice L. W. Felt, resigned.

J. T. KESCEL of the Sheba G. & S. M. Co. at Mills, Nev., has resigned and accepted the position of mill foreman of the Keith-Kearns Co. at Park City, Utah.

DEAN V. C. ALDERSON of the Armour Institute of Technology has been elected president of the Colorado School of Mines at Golden, Colo. He will assume the duties of his office July 1.

W. H. CHILD of Salt Lake City, Utah, secretary and treasurer of the Sheba G. & S. M. Co., is at their mines near Mill City, Humboldt county, Nev., after a business trip to San Francisco, Cal.

C. SWIFT, who for some time past has been mill man for the New Western M. Co. at Plymouth, Amador county, Cal., has gone to Ortiz, Sonora, Mexico, to take charge of the mill of the Bonacito M. Co.

J. F. PARKS, superintendent of the Kennedy mine, near Jackson, Amador county, Cal., returned last week from Palm Springs, Riverside county, Cal., where he has been visiting for several weeks.

P. TRANE has resigned as manager of the Golden West M. Co., operating in the Hornblende district, west of Rochford, S. D., and will spend the remainder of the summer in Bear Lodge district in western portion of the Black Hills.

Commercial Paragraphs.

THE Stillwell-Bierce & Smith-Valle Co. of Dayton, Ohio, report the Penohscot M. Co., of Deadwood, South Dakota, are putting in one of their Stillwell feedwater heaters.

THE American Diamond Rock Drill Co. of New York report they have recently sold several diamond drills to the Argentine Government. The Government of the Argentine Republic having decided to develop and prospect their mineral lands by means of the diamond drill, sent out an engineer to act in their interest and to examine existing machines and methods of boring; and the orders were placed after a tour through France, Germany, England and the United States.

THE Magnolia Metal Co., whose New York City factory was burned out in June, 1902, only a few weeks after the structure had been completed, are rebuilding on a larger scale, and the firm expects to occupy its new quarters about August 1. Meanwhile the metal business is being conducted at 511-513 West 13th street. The company has opened a factory in San Francisco, Cal., where all grades of babbit metal, including their "Magnolia" brand, are manufactured. Dwight Hiscox is Pacific coast representative, with offices in the Hearst Bldg., San Francisco, Cal.

THE Turner Brass Works, 53 North Franklin street, Chicago, Ill., are distributing to the trade copies of their new 66 page catalogue of gasoline torches and other gasoline appliances. It is fully illustrated and contains several new styles of double jet torches and other appliances recently placed upon the market. The Old Reliable torches and Straight-Turner brazing forges have been known to mechanics for several years, but the Turner gasoline bunsen light and Manyscope, Franklin torch, crucible furnace outfits, pressure indicating pump and several new styles of double jet torches are shown in this catalogue for the first time. A full description of the Turner double jet torches is given explaining the underlying principles. The demand for these torches, they claim, is increasing.

Books Received.

The annual report of the Minister of Mines of British Columbia for 1902 has been received. It comprises 320 pages of descriptive text relative to the coal and metal mines of that province, and includes numerous illustrations, which give a better idea of the character of the country than many pages of text.

"Index to Oil Wells in City of Los Angeles, Los Angeles Co., Cal.," is the title of the latest bulletin issued by the State Mining Bureau, Ferry Bldg., San Francisco, Cal.; L. E. Aubrey, State Mineralogist. It is accompanied by a map of the fields, showing the location of all wells, tanks and pumping plants. Price, 35 cents; postage, 2 cents.

The eleventh edition of "Mining Rights in the Western States and Territories," by R. S. Morrison and Emilio D. De Soto, of the Colorado bar, comes revised to date. This little volume of 530 pages is a compendium of mining laws, local rules, court decisions, forms, and office procedure, and other valuable information to a work of this character, and cannot fail to be of value to the mine locator, owner and operator. It also contains an interesting glossary of mining terms. Published by the Smith-Brooks Printing Co., of Denver, Colo.

Obituary.

J. ARNOTT, a pioneer miner of Sierra county, died at Alameda, Cal., on the 15th inst., after a lingering illness from a complication of diseases incidental to old age. Deceased was a native of Scotland, aged 75 years. He is survived by four daughters and one son.

A. H. COULTER, a pioneer miner and surveyor of California, and for several years county surveyor of Calaveras county, and a United States deputy mineral surveyor, died at San Andreas, Cal., on the 10th inst. Deceased was born in Charlotte, N. C., June, 1827, and came to California in 1849. He was Justice of Peace at El Dorado in 1863. He is survived by two daughters and two sons—one, W. S. Coulter, being at present county surveyor of Calaveras county.

New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR WEEK ENDING JUNE 9, 1903.

730,431.—BRAKE LEVER—E. M. Akers, Ione, Or.
730,432.—BOX FASTENER—A. Bennett, Puyallup, Wash.
730,433.—ANIMAL TRAP—C. C. Bowen, Los Angeles, Cal.
730,434.—GAS ENGINE—A. M. Coburn, Daunt, Cal.
730,435.—BICYCLE BALANCE—M. L. Edmunds, Bandon, Or.
730,451.—BLANK HOLDER—R. B. Friend, Oakland, Cal.
730,452.—TOILET PAPER HOLDER—R. B. Friend, Oakland, Cal.
730,765.—BOILER—G. Hansen, S. F.
730,370.—LIFTER—W. H. Hendrix, Seattle, Wash.
730,463.—SIPHON TRAP—J. E. Keyt, S. F.
730,464.—STOVE—F. Krux, S. F.
730,677.—AWNING—H. C. Marcus, Bohemia, Or.
730,855.—PROCESS TREATING ORES—D. Mosher, S. F.
730,580.—WAVE MOTOR—G. Nobletodd, Los Angeles, Cal.
730,402.—ROPE TRAMWAY TOWER—B. C. Riblet, Spokane, Wash.
730,571.—GAME BOARD—H. H. Rolfe, S. F.
73,553.—SOLAR PRINTER—H. Stender, Los Angeles, Cal.
730,412.—FRUIT GRADER—R. Strain, Fullerton, Cal.
730,414.—DRILL TOOL SOCKET—E. Strickland, Los Angeles, Cal.
730,415.—UNDERREAMER—E. Strickland, Los Angeles, Cal.
730,490.—VEIL HOLDER—Pauline Tilt, Oakland, Cal.
730,587.—WRENCH—J. B. Tupper, S. F.
730,321.—CINCH PLATE—A. P. Weeks, Santa Cruz, Cal.
730,429.—AXLE PROTECTOR—G. Wood, Ballard, Wash.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

PAD OR BLANK HOLDING AND FEEDING DEVICE.—No. 730,451. June 9, 1903. R. B. Friend, Oakland, Cal. This invention relates to a device for the convenient handling of blanks of all descriptions which are used in packages or pads of greater or less thickness, such as telegraphic or insurance blanks or checks, postoffice money order blanks, writing pads or any papers which are put up in similar forms. The object of the invention is to provide a desk with a rising and falling platform or surface upon which the pad or blanks may be supported, and by means of which the upper surface of the pad or blanks may be kept constantly at such a level as to be convenient for the writer.

TOILET PAPER HOLDER.—No. 730,452. June 9, 1903. R. B. Friend, Oakland, Cal. The object of this invention is to provide a cheap and convenient containing box for toilet and like papers which are interfolded and which when placed in a suitable receptacle present the edge of the paper through a slot, so that the withdrawing of the edge presented will not bring the edge of the following sheet or sheets into the slot and ready for withdrawal when the first sheet or series is removed. It consists of a box having dimensions sufficient to contain the paper, which is put up in packages of a thousand sheets more or less, a spring-pressed platform by which the package is held against the delivery side, a slit or opening through which the edge of the paper is presented, and means for holding the paper so that it will not be discharged in too large quantities.

Latest Market Reports.

SAN FRANCISCO, June 19, 1903.

METALS.

SILVER.—Per oz., Troy: London, 24½d (standard ounce, 925 fine); New York, bar silver, 52½c, refined (1000 fine): San Francisco, 52½c; Mexican dollars, 41 @ 41½c San Francisco, 41c New York.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50 @ \$14.75; Electrolytic, 1 to 3 casks, \$14.50 @ \$14.75; Casting, 1 to 3 casks, \$14.00; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18 @ 24c. London: £57 2s 6d spot per ton.

The German consumption for foreign copper for January-April, 1903, compared with the same period of 1902, was as follows, in tons:

	1903.	1902.
Imports.....	27,260	27,309
Exports.....	3,833	2,905

Consumption.....23,427 24,404

The copper market is uneasy, but is apparently more affected by speculation in copper mine shares than by the actual condition of the market. It is expected that a few days more will serve to either strengthen the present market price or a decline in it. No one seems to be able to predict what the outcome will be. While it seems strange that speculation in copper shares should have an influence on the market, it does nevertheless.

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½; pig, \$4.75. London: £11 3s 9d per long ton=2.75c per lb.

SPELTER.—New York, \$6.25; St. Louis, \$4.85; London, £20 2s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-

lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13 @ 15c.

TIN.—New York, pig, \$28.00 @ 28 25; San Francisco, ton lots, 30½c; 500 lbs., 31c; 200 lbs., 31½c; less, 32c; har tin, 3½, 35c @ 37½c. London, £129 5s spot.

PLATINUM.—San Francisco, crude, \$18.00 3/4 oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75 @ 80c per gram.

QUICKSILVER.—New York, \$44.50 @ 46.00; large lots, London, £8 15s; San Francisco, local, \$45.00 3/4 flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90½, 30c to 34c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.75c.

NICKEL.—New York, 50 @ 60c 3/4 lb.; ton lots, 45 @ 48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$19.75 @ 20.25; gray forge, \$18 60; San Francisco, har, 3c 3/4 lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$29 60 @ 30.50; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$21.00 @ 21.50
Foundry Northern 1.....	20.50 @ 21.00
Northern 2.....	20.00 @ 21.50
Northern 3.....	19.50 @ 20.00
Southern 1.....	19.85 @ —
Southern 2.....	19.35 @ —
Southern 3.....	18.85 @ —
Forge.....	18.35 @ —
Charcoal.....	24.00 @ 24.50
Billets, Bessemer.....	31.50 @ 32.00
Bars, iron.....	1.75 @ —
Bars, steel.....	1.75 @ 1.80
Rails, standard.....	28.00 @ 30.00
Rails, light.....	34.00 @ 40.00
Plates, boiler.....	1.90 @ 2.00
Tank.....	1.75 @ 1.80
Sheets, 26 store.....	2.90 @ 3.00
No. 27.....	3.00 @ 3.10
No. 28.....	3.00 @ 3.10
Angles.....	1.75 @ —
Beams.....	1.75 @ —
Tees.....	1.80 @ —
Zees.....	1.75 @ —
Channels.....	1.75 @ —
Steel melting scrap.....	16.50 @ 17.00
Relaying rails.....	29.00 @ 30.00
Dealers forge.....	14.50 @ 15.00
No. 1 railroad wrought.....	17.50 @ 18.00
No. 1 cast, net ton.....	15.00 @ 15.50
Iron rails.....	22.00 @ 23.00
Car wheels.....	21.00 @ 22.00
Cast borings.....	6.00 @ 7.00
Turnings.....	12.00 @ 13.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00 @ 22.00; extra sizes higher; redwood, \$22.00 @ 23.00; lath, 4 feet, \$4.25 @ 4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @ 32.00.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmore, \$2.90; Trowell, \$2.90; Portland, \$2.50 @ 2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Har-

hor, \$2.25 per bbl.

GENERAL SUPPLIES.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30% carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 725 kegs, \$1.60 per keg; less car lots, 2¢ per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

OILS.—Linseed, hotted, bbl., 54c; cs., 59c; raw, bbl., 54c; cs., 59c; Lucol oil, hotted, bbl., 48c; cs., 53c; raw, bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzine, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50 @ 60c; Natural White, 65c; Bleached do, 70c; Whale Oil, cs., 50 @ 55c.

CANDLES.—Granite 6s, 16 oz., 40s., 10½c 3/4 set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 24 @ 25c 3/4 lb.; carloads,

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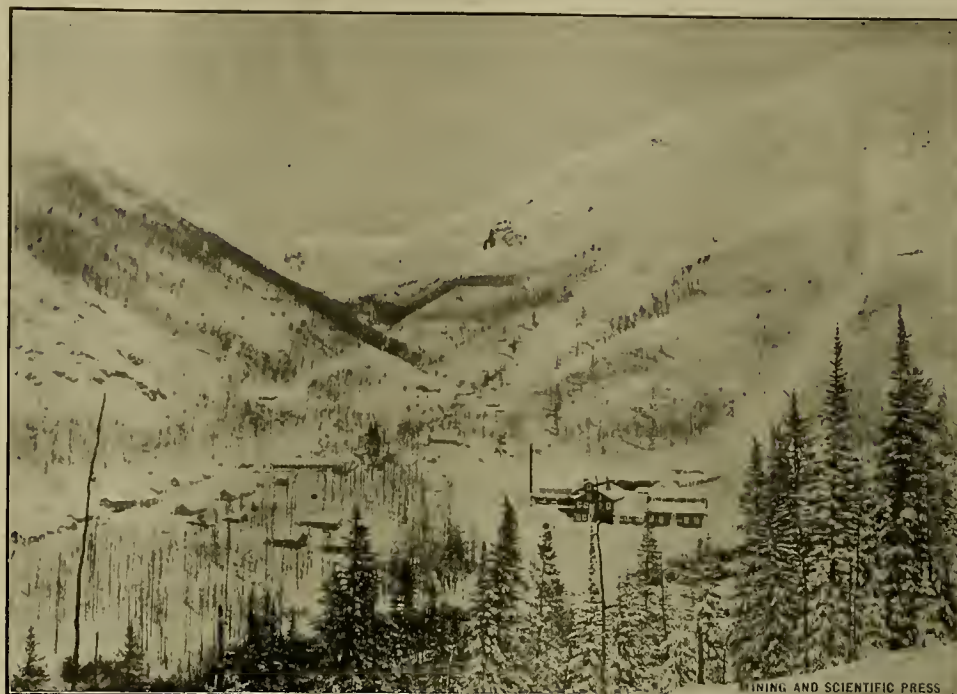
SAN FRANCISCO, CAL., SATURDAY, JUNE 27, 1903.

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Danger in the Cut-Off Hole.

The life of the miner is one of constant danger when working at his employment; at least, that is the usual impression, though statistics show that there are other occupations more hazardous, which are popularly considered less so. Among the causes of accidents in mines, those resulting from premature or accidental explosion of nitro powder are probably the most numerous. Falls of rock from the roof; the unexpected caving of stopes; falling of cages, skips or other vehicles in the shaft, and the falling of men into shafts and winzes, and from high positions in stopes or raises, all contribute to the injury and death of men engaged in mining, and the defective fuse is also responsible for many casualties. Miners usually can guard against the slow, imperfect fuse, by giving the shot time, though defective fuse sometimes "hangs fire" for several hours, and very frequently for half an hour or thereabouts, but the danger from "cut off" holes is one most difficult to guard against, for the reason that the detonating cap may explode and discharge the stick of powder, in which the cap had been inserted, when the miners, who customarily listen and count the shots, would credit the blast with having been properly discharged. The powder still remaining in the bottom of the hole which was cut off on a jointing plane of the rock by a previous blast, forms the element of danger. Such a hole is often difficult to discover even when its existence is suspected. On the morning of June 16 this condition was the cause of an explosion which resulted in the death of a miner and serious injury of another in the Empire shaft at Grass Valley, Cal. A few months since an identically similar accident occurred in the shaft of the Lincoln mine at Sutter Creek, Cal.

In each case a "cut-off hole" containing powder was drilled into by the machine, and the succeeding explosion resulted in the death and injury of miners as stated. In each case, also, the men had been at work several hours, and had industriously searched for missed holes. Missed holes can usually be located, as the rock surrounding them, not being broken, is an index of their whereabouts, but not so the "cut-off hole." How such accidents may be avoided is a difficult problem, particularly in a wet shaft, where everything is covered by muck, making it almost impossible to find such a hole. By cleaning up



Fraser Mountain Copper Co.'s Camp, Twining, New Mexico. (See page 409)

and feeling carefully about with an iron bar, often under water, it being impossible to keep the bottom of the shaft absolutely dry, one may sometimes locate the hole, but the chances are against the miner finding it. By rare good fortune, too, he may fail to find it when drilling, but such was not the fate of those killed in the two accidents mentioned. Such occurrences emphasize the necessity of care under similar circumstances, for in each of these instances the full number of reports were not heard. The "cut-off hole," however, is a hidden danger often not suspected. The danger may possibly be lessened somewhat by placing the primer near the bottom of the hole, using the very best "triple tape" fuse. In following this method there is, of course, the possibility of setting fire to the powder, which would then burn without other effect than that with which the miner is familiar when this occurs, the filling of the

workings with a dense cloud of nitrous oxide, and complete failure of the blast.

The Need of Experience.

In the operation of low-grade mines success can usually only be assured or made possible by a combination of happy conditions or circumstances. If a gold mine, the vein or deposit should be extensive, the rock easy to break, not too expensive to support, and transportation must be inexpensive. Supplies must be obtainable at low cost; the ore must be free milling or offer no unusual difficulties in its reduction. Power must be cheap—free water power preferred; wages must not be too high; timber easily or cheaply obtainable, and the mine must have efficient, experienced management in every department of mine, mill and office. The more favorable these several conditions are the lower the grade of property that may be made to yield a profit. If it be a smelting proposition, the problems are fluxes, fuel, power, water, timber, process for reduction of the ores and comparative cost of several process, and in addition to these the market price of the product, which in a smelting proposition is usually a base metal, as copper, lead or zinc as well as possibly gold and silver. In this case competent management is even more essential, as the difficulties besetting the smelter are usually more numerous than those of the millman. Almost any one can successfully manage a rich, free-gold mine, but one must have experience to work a low-grade gold mine successfully, and technical chemical knowledge as well to operate successfully a smelting proposition.

AN interesting legal case has been before the Supreme Court of British Columbia, wherein the title to a mining location was adversed because one of the location stakes set upon the ice of a glacier. This post being set in the ice and not "in the ground," as required by the law, was argued by the plaintiff that as this post was not "set in the ground," as required by the statutes, the claim of defendant was not valid. The court has reserved decision and taken the case under advisement. While this case is of interest, it is fortunately one not likely often to occur, as there are few mining locations made under similar circumstances.



Fraser Mountain Copper Co.'s Reduction Works, Twining, New Mexico. (See page 409)

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TABLE OF CONTENTS.

ILLUSTRATIONS:	Page.
Fraser Mountain Copper Co.'s Camp, Twining, New Mexico.....	406
Fraser Mountain Copper Co.'s Reduction Works, Twining, New Mexico.....	408
Drill-Hole Gold Computer.....	409
Interior Fraser Mountain Copper Co.'s Concentrator, Twining, New Mexico.....	409
The Bartlett & Snow Dryer.....	409
Automatic Tailings Sampler.....	410
New Crucible Furnace.....	411
The Griffiths Automatic Hammer.....	412
Arrangement of Cyanide Tanks, Dakota Mill.....	413
Arrangement of Precipitation Barrels, Dakota Mill.....	413
Mining and Metallurgical Patents.....	413
EDITORIAL:	
Danger in the Cut-Off Hole.....	405
The Need of Experience.....	405
An Interesting Legal Case.....	406
Another Milestone.....	406
The Clairvoyant and the Miner.....	406
A Blow at Fake Promotions.....	406
The Labor Situation.....	406
MINING SUMMARY.....	415-416-417-418-419
LATEST MARKET REPORTS.....	420
MISCELLANEOUS:	
Concentrates.....	407
Measurements Relating to Alluvial Deposits.....	408
Chemical Analysis of Igneous Rocks.....	409
A New Mexico Copper Mine.....	409
The Bartlett & Snow Dryer.....	409
Automatic Tailings Sampler.....	410
Vibration in Batteries.....	411
Emerald Mines in Colombia.....	411
A New Crucible Furnace.....	411
The Mining of Diamonds.....	412
The Griffiths Automatic Hammer.....	412
Compressor Explosions.....	412
Mexican Duty on Explosives.....	412
German Inquiry for Red Zinc Ore.....	412
Cyaniding in the Black Hills.....	413
Wyoming Topography.....	413
Tin in the East Indies.....	413
Mining and Metallurgical Patents.....	414
Personal.....	419
Commercial Paragraphs.....	419
Catalogues Received.....	419
Books Received.....	419
New Patents.....	419
Notices of Recent Patents.....	419
Obituary.....	420

Another Milestone.

With this issue of the MINING AND SCIENTIFIC PRESS ends Volume LXXXVI. This volume contains 404 pages of reading matter and illustrations. Within these pages will be found a chronicle of the progress in mining and metallurgy the first half of the year 1903. There are many very valuable technical papers; descriptive and newsy articles from all over the mining world. The aim is constantly to present the latest and best in those subjects related to the mining industry, and to put these things before the readers of the MINING AND SCIENTIFIC PRESS in a form which will place a knowledge of technical, scientific and mechanical practice within the reach of all. The illustrations found weekly herein form a valuable part of the paper. The greater portion of them are specially engraved for this journal, and usually the photographs from which the engravings are made have been taken specially for this purpose. These engravings illustrate every phase of mining and metallurgy. By their means the readers of the MINING AND SCIENTIFIC PRESS gain an accurate knowledge of the situation and appearance of mining regions never visited by them. The great reduction works in various portions of the world; the mining practice everywhere—particularly that which is new or valuable—is also illustrated herein. In the advertising pages will be found, illustrated and described, every mining appliance which ingenuity and modern foundries and shops can produce. Nothing forms a better criterion of the onward march of progress in mining than the illustrated advertisements in technical journals. Attention is also called to the index accompanying this issue. By its use the reader may find any article on any subject published herein during the half-year just closing. The index should be preserved and bound with the papers forming the volume.

The Clairvoyant and the Miner.

Strange as it may appear, the clairvoyant is popular with the miner. One would naturally suppose that a man as thoroughly practical as a miner is supposed of necessity to be, would be the last man in the world to seek fortune through the medium of the clairvoyant, the fortune-teller or the astrologer; yet the miner is the constant prey of these "humbugs." The usual plan is for the miner, or mine owner, to go to the clairvoyant—one who has an established "reputation" preferred, one who has pointed out some of the richest mines in the country. The seeress—for they are usually women who ply this craft—takes the specimen of rock in hand and proceeds in a dreamy way to instruct the client in the geology of a rich ore deposit. The country rock is described. The size of the vein and its value are unmistakably outlined, and the sort of machinery necessary for its beneficiation is made equally plain, and the miner goes away dazed, not so much at the magnitude of the fortune that awaits him as by the fact that he fancies the fortune-teller has been able to correctly describe his property in all its detail, and that her diagnosis of the case agrees with his own. He proceeds to follow the ghostly advice as directed by the spirits, and about once in a thousand times he strikes it right. The percentage of success would no doubt be much higher if he would follow the dictates of his own common sense and experience, but to these he gives little credit when dealing with the mysteries of that unknown realm so familiar to the clairvoyant.

To recite the numerous disastrous failures resulting from blindly following the advice of clairvoyants would fill a good-sized book, for these instances far overreach the successes, and no one will deny that, in the case of the latter, success would have resulted without the aid or intervention of the fortune-teller. How any one can be misled by this class of fakir passes understanding. The clairvoyant is had, but no worse than the man with the "dowsing rod," the "gold finder," "divining rod" and other contrivances for fooling the credulous miner as well as others. There is no need to say the "ignorant miner," for he is usually not ignorant, and it is a matter of constant surprise to find well-educated people, who would place no confidence in the clairvoyant, blindly following the fellow with the "forked stick." The "professors" of this "graft" claim to be able to locate gold, silver, copper, lead, tin, zinc, diamonds, oil and many other desirable things. In order to do this they have "instruments" shaped like the letter Y, in the end of which the particular "batteries" for finding any stated mineral substance is secured. Then, with the forked ends in their hands, they walk soberly to and fro over the mineral ground. Suddenly they are observed to have a spasm—sometimes several—the nervous excitement is something pitiful to behold, but the work is done and the rich ore body has been located. The "professor" reluctantly permits a fee of \$20 per day and expenses to be thrust upon him, and the client—well, he proceeds to put up "assessments." One "professor" in the southern California oil fields had a "divining rod" constructed with particular reference to the location of oil lines. This remarkable instrument was fitted with a hollow hulk containing an ounce of the "professor's" blood. When ready to undertake the difficult task of locating the site for a new oil well—for that it is a difficult task must be admitted—he filled his mouth with water and began his strenuous work. Should he accidentally stub his toe and swallow the water or otherwise discharge the fluid from his mouth, the search could not be resumed until the following day, as the "professor" was completely prostrated by reason of his strenuous, nerve-tearing experience with the "divining rod," but his pay was \$20 per day and expenses, so the "professor" managed to stand it. How any one can be deceived by such chicanery and fraud is past understanding, but the victims of this sort of thing are not by any means rare. There are others, who have other instruments, who work in a different manner, but in one thing they are all alike—they all impose upon and swindle those who credulously employ and pay them for such services. There should be a law to protect the unwary from this class of sharks, and the law should provide a penalty which should be strictly applied.

A Blow at Fake Promotions.

The State of Connecticut has taken steps to protect investors in mining and oil stocks from being victimized by unscrupulous promoters. The new law is applicable to the stock of any mining or oil company, no matter under the laws of what State or Territory it may have been incorporated. It is the purpose of the Connecticut law to forbid the stocks of any mining or oil company being sold or offered for sale within that State before an affidavit shall have been filed with the Secretary of State giving a truthful statement of the financial condition of the corporation, the location of its property, the amount of development work done, and money expended in development and equipment, and the actual condition of the plant and the property. The Eastern cities have been flooded with stock of mining and oil companies that are purely fictitious, or, if possessing mining or oil lands, the same are of little or no proven worth. While this is a step in the right direction and will have a restraining influence on fraudulent promoters, still there are those to whom a sworn statement like that required in Connecticut would be a matter of small moment. Such a law without bonds would have little effect with some of those engaged in promoting fake mining schemes. While such a law as this would no doubt make it more difficult to place the stock of a legitimate as well as of an illegitimate enterprise, there would be fewer failures and mining would advance to a higher plane in the public esteem. Really there is no reason, other than the wholesale promotion of worthless schemes by irresponsible people, why mining should not stand as high in the estimation of investors as any other form of industrial investment. No other industry pays as large dividends on the capital actually invested as a successful mine. Profitable mines are made—are the result of careful development and the exercise of good business experience and sagacious, practical management, and not always the result of a lucky strike, though it is also true that the element of good fortune often makes it possible for the miner to realize far greater result from his investment than he has any reasonable right to anticipate. No other industrial pursuit affords as great opportunities. It is a knowledge of these facts and the recital of the stories of the sudden wealth coming to some men in mining, that makes it possible for the promoter to excite the cupidity of the would-be investor to the extent of making an exchange of mining stock for cash, and the investor too often awakens to the fact that he has not chosen wisely—that his mine is not one of the winners.

The Labor Situation.

It is about sixteen weeks since the coal mines at Ladysmith, B. C., were closed down by the owner, J. Dunsmuir, for the reason that the miners organized under the banners of the Western Federation of Miners. Mr. Dunsmuir is quoted as saying that he had no objection to the miners employed by him organizing a union, but objected strenuously to their affiliating with the Western Federation, that organization having its headquarters in the United States, and he would not permit a foreign organization to dictate the terms under which he could operate his mines, and would close them down forever if necessary. The mines were closed, and for sixteen weeks the struggle continued, with no sign of change or effort to effect a reconciliation on the part of the owner. The miners petitioned Mr. Dunsmuir to reopen the mines, and asked to be allowed to work on the same terms as before, agreeing to renounce the Western Federation. When Mr. Dunsmuir presented a contract to control for two years the miners objected to some of its terms and refused to sign, and the mines will probably still remain closed. The miners at Searchlight, Nev., are still out, and the owners and managers are in Los Angeles, Cal. This is the season when the heat is intense on the desert, and the managers evidently prefer life in Los Angeles to that on the desert, consequently no immediate settlement is looked for. There is no change in the situation at Randshurg, Cal. Nearly all the mines in the district are closed. The difficulty there is over an increase in pay. Conditions are much disturbed in Arizona, though in Yavapai county no trouble has occurred.

CONCENTRATES.

No anle acid affects either gold or platinum.

THE Legislature of Arizona has not adopted a code of bell signals. There is no uniform code in use in that Territory.

TETRAHEDRITE is another name for ordinary gray copper, a sulphide of copper, antimony and other metals, finely crystallized.

A CRITH WEIGHT is a technical electrical term. A crith weight is equal to the weight of a liter or cubic decimeter of hydrogen, .089873 grams.

THE name "tiff" is that by which fluor spar is known to Cornish miners, and the application of the term "tiff" to the small crystals of calcite occurring in Missouri lead and zinc mines is a misnomer. Calcite is also known as calcespar, limespar and Icelandspar.

THE average cost in the United States of refining copper and recovering from it the gold and silver is stated to be \$5 per ton. It is now thought this cost can be materially reduced by employing a higher current of electricity than usually used in the electrolytic method.

THE tendency to disintegrate on the part of concrete foundations for stamp batteries has been a problem at times difficult of solution. The best quality of concrete should be used. To overcome the absorbing of moisture the use of a cover or fold of oiled paper has been found of value.

PALLADIUM is separated from copper by saturating the solution containing the two metals with sulphurous acid, and adding a solution of potassium sulphocyanate. The reagent has no action on palladium, while it completely precipitates the copper in the form of a white sulphocyanate.

ORDINARILY alloys have a smaller volume than their uncombined constituents, but in the case of aluminum and antimony there is an expansion instead of the usual contraction. When 7.07 cubic centimeters of aluminum are alloyed with 12.07 cubic centimeters of antimony, the result is 23.71 cubic centimeters of alloy.

REPLYING to a question from John Day, Oregon: The commercial analysis of petroleum is effected by fractional distillation. The ultimate analysis requires a very comprehensive knowledge of organic chemistry. Would suggest sending to California State Mining Bureau, San Francisco, Cal., for Bulletins No. 3, 6 and 19; see, also, "Brant on Petroleum."

THE rock sample from Cerbat, Arizona, is not fluor spar, but feldspar (orthoclase, mostly). The rock has no commercial value where situated. When convenient to cheap transportation in some of the Eastern States a good, clean orthoclase is worth about \$4 a ton. It is used in the manufacture of tiles, pottery, etc., and also to some extent in the manufacture of glass.

TWO good books on petroleum are "Petroleum, Its History, Origin, Occurrence, Physical and Chemical Constitution, Technology and Uses," translated from the German by W. T. Brant (price \$7.50), and "A Practical Treatise on Petroleum," by Benj. J. Crew (price \$7.50). Either of these volumes gives a large amount of valuable information concerning petroleum oil.

A MINING CLAIM located October, 1902, in California, is not subject to relocation because of non-performance of annual assessment until midnight, December 31, 1903, when if the work still remains undone the claim reverts to the public domain and may be claimed by any one. The Federal statute requires that the first assessment work must be done within the year next succeeding the first of January following the date of location.

SILICIDES OF CALCIUM, BARIUM AND STRONTIUM are formed in the electric furnace at higher temperatures than those required to produce the carbides. The silicides decompose with water and yield free hydrogen in a pure state. These silicides give promise of importance in steel industries through their actions on sulphur and phosphorus. It is stated that, by use of these silicides, sulphides and phosphides are formed which are eliminated in the slag, and that an iron high in sulphur and phosphorus yielded by this treatment a steel from which the last traces of sulphur and phosphorus were removed.

BAUME was the name of a man who devised an apparatus for determining the specific gravity of liquids. This apparatus for liquids lighter than water consists of a hollow glass stem with a bulb blown in the middle so as to insure buoyancy, and another bulb in the bottom to hold mercury, like the bulb of a thermometer. A short distance above the upper bulb Baume made a mark and then poured sufficient mercury into the lower bulb so that the apparatus would sink in a 10% solution of salt and water to that mark. The apparatus (called a hydrometer) was then immersed in pure water, which is much lighter than salt and water, and of course the hydrometer sank deeper. The point to which the stem

sank in the water was carefully marked. The distance between these two marks was graduated into ten parts, called degrees, the bottom zero, the upper one 10. Water is therefore 10° Baume, written "°B. 10" or "10° B." There is also a Baume hydrometer for testing the density of liquids heavier than water.

WHERE A makes a discovery and claims 1500 feet along the lode in one direction from his monument, thereby placing his discovery at one end of the claim, and falls to erect his boundary monuments or stakes within sixty days, but has placed his claim on record, and begins the work of "annual assessment," and B comes along and locates a claim, and in so doing takes in a large portion of the ground claimed by A, the outlines of which are, as yet, unmarked, it is doubtful if the courts would recognize B's location. Some States fix the time by legislative act within which the boundaries of a claim shall be marked, but California has no such law.

THE crushing strength of structural materials can only be determined by actual test. The resistance which various kinds of material offers to pressure varies greatly. The best pressed brick will sustain from 555 pounds to over 4000 pounds per square inch. Granite from 4000 to 16,000 pounds per square inch. Limestone and marble 5000 to 20,000 pounds. Granite commonly ranges between 12,000 and 15,000 pounds per square inch, though some has been known to run as high as 35,000 pounds. This latter, from a quarry on the Connecticut river, was tested at the Watertown United States arsenal. Books on mechanical engineering usually contain more or less data on this subject.

BEACH MINING in California, although carried on in former years at many points from Lompoc in Santa Barbara county in the south to Del Norte county in the north, has never been a very profitable industry, and very little has been done in the way of beach mining in California for many years. At one time there were numerous "plants" of many kinds, ingenious and otherwise, for working the gold-bearing sands, but either the sands were too poor in gold or the machines too ill adapted for saving what gold was contained in the sands, for beach mining has been stopped. Northward in Oregon and in Alaska beach mining has been more profitable, particularly in the latter section.

THERE have been a multitude of oil burners patented on the general design of admitting liquid fuel into boiler furnaces. They may be divided into three types: (1) Mechanical spray in which the liquid fuel is forced under pressure through nozzles, made of such a form as to break it up into fine spray and thus render it inflammable; (2) spray burners, where the liquid fuel is held in suspension and driven into the furnace by means of a jet of steam and compressed air; (3) vapor burners in which the liquid fuel is volatilized and the vapor admitted to the furnace. All three have their advocates and possess a certain degree of merit. The second type is probably the widest known and in most extended general use.

METEORIC IRON found in the Canyon Diablo, Ariz., showed in the midst of the metallic mass two small transparent diamonds. The iron containing the carbon must have been at first in the liquid state, and by reason of a sudden cooling there occurred a violent contraction of the mass, the carbon passing from a density of 2.0 to that of 3.5, giving the diamonds. M. Moissan has successfully imitated the processes of nature and has produced microscopic diamonds by means of fusing iron saturated with carbon and an electric furnace. Two things detract from the value of these artificially produced diamonds—they are very small, and after a few months they tend to split and crumble into finest powder, "diamond dust."

IN masonry construction a good way in making concrete is to mix the cement and sand dry (this should always be done), and thoroughly drench the broken stone with water; then mix stones and mortar together without further addition of water until the mass has been well turned over. Then, while continuing the mixing, add water (by sprinkling, not dashing) until the proper fluidity has been secured. In a very wet foundation pit of small area good results may be obtained by pumping vigorously up to the last minute, then pulling out the pumps and quickly shoveling in the concrete without any further admixture of water, merely leveling it off and allowing the water to rise and percolate through it. It will soon get quite wet enough and can be settled in place by gentle ramming. The work is not finished when the concrete is made, mixed and rammed. All exposed surfaces should be kept constantly and thoroughly moist for an indefinite period, the longer the better. The top surface of a concrete foundation must be kept wet until it is covered by the superstructure.

MANY mines have replaced animal haulage with compressed air motors. There are, in general, two systems—the low-pressure system, in which air is compressed to 500 or 600 pounds, and the high-pressure system, with air pressure of 2000 pounds and over. The former system can be used in large galleries or tunnels or drifts where the width is ample and the track is reasonably straight. This permits a large receiver on the motor, 30 to 40 inches in diameter and from 8 to 16 feet long, to be handled with ease. The high-pressure system is used where the drifts are narrow or the curves on a small

radius, permitting only a small wheel base on the motor. Compressed air may be used cold on either of these motors, or the air may be passed to small tanks of hot water supplied to the motor at the charging stations. The air and hot water combination does almost double the work that cold air will do. These motors can carry sufficient air for any ordinary run desired and haul big loads. Two miles and return, with fifteen or twenty loaded cars, is not extraordinary, and from the general results obtained, the cost of haulage is from one-half to one-third of the cost of the animal power. The air escaping from the exhaust of the motor engines adds to the ventilating effect in the mine and the whole system harmonizes thoroughly with the power outfit of the average mine.

IF a metal be cooled very slowly past its freezing point, its structure will be comparatively large; if it be cooled rapidly past its freezing point, the result will be a much finer or more minute structure. In cooling slowly, crystals start to grow from a comparatively few points only, and the resulting structure is large; in rapid cooling, the points of initial crystallization are numerous, and the structure on complete solidification is small. When a crystal starts from a point it grows in all directions till interfered with by the growth of adjacent crystals. As the crystals seldom grow so that their crystallographic axes lie in the same directions, one finds on solidification that each has a different orientation. This difference in orientation is beautifully seen if one takes ingots of lead, tin, cadmium, zinc, etc., and lightly etches their surfaces. The effect of etching is to take off the surface of the metal, but not as a film of uniform thickness. The acid has not the same effect on each crystal, but removes more of one than of another, the amount depending on the position of the crystal with relation to the surface which is being etched. The acid follows the track of the secondary crystals, or rather grains, and so we have a step-like surface etched, which resembles, more or less, a broken surface of galena. Thus, light is more or less reflected from each crystal, depending on the angle at which the step-like surface is inclined.

ZINCBLLENDE is not materially affected by cyanide solutions, nor is the solution decomposed to any extent thereby, but oxidized zinc ores, like zinc carbonate, must be calcined before treatment. Alkali sulphides, when formed during cyaniding, will cause a loss of gold by precipitating the metal and covering it with a film of sulphur, preventing the gold from redissolving. The sulphur of antimony and copper sulphides appears to possess some peculiarity which causes them to form alkaline sulphides in cyanide solutions. These minerals are readily attacked by potassic cyanide, forming the salt known as potassic sulphide. Telluride ores apparently have no bad effect on cyanide solutions, as large amounts of ore containing these minerals are successfully treated in Colorado and South Dakota. Roasting of these ores is sometimes resorted to order to make them more porous, as when in this condition the rate of percolation is materially increased, and leaching is also expedited. Arsenical ores are a problem not wholly understood nor always the same. Those at Mercur, Utah, are readily amenable to this process, and at Del Oro mine, Ontario, Canada, the bromo-cyanide process is successfully applied to the treatment of arsenical ores. Manganese is not a harmful mineral in cyanide solutions so far as observed. Iron sulphide containing gold may usually be successfully treated by the cyanide process, but in some ores of this description extremely fine grinding is necessary in order to secure a reasonably high extraction. Vanner concentrates sometimes yield their gold readily to this process, but the percentage of extraction usually bears an important relation to the fineness of the material to be treated.

IN refining crude petroleum, the crude oil is run into a storage tank, sometimes of 25,000 barrels capacity, and thence is pumped into a still—a steel cylinder 12½ feet in diameter, 30 feet in length, holding about 600 barrels. With this still is a dome and gooseneck. By fire under the filled still, the volatile constituents of the crude oil are driven into the condensers where they are cooled and flow from the pipe as a liquid. These oil distillates that have come from the crude still are now put into a still worked entirely by steam, to drive off the inflammable gases that came with the product from the result in the crude still. The steam's heat vaporizes these gases and carries them into a condenser to be liquefied. The distillation is continued until the oil will stand the fire test. When the oil comes from the first or crude still, it is filled with gases, has a greenish color and a disagreeable odor. The gases have been largely removed by the steam still. The oil is now in a measure safe, but needs to be cleaned. It is run into a large vertical cylinder that holds over a thousand barrels. Generally this cylinder is lined with lead, as sulphuric acid is now mixed with the distillate. The mixture of oil and acid is agitated by air under pressure. When the agitation is done, the acid is charged with matter picked up from the oil. This acid with its charge gradually sinks by gravity to the bottom, free from the oil, which remains on top. As no acid must be left in the oil, it is neutralized by an alkali, generally soda, the soda being drawn away as the acid was. After these treatments with acid and soda, the oil is thoroughly washed with water, then run into broad, shallow, settling pans, where it is allowed to stand and become bright and clear.

Measurements Relating to Alluvial Deposits.

Written for the MINING AND SCIENTIFIC PRESS by
RALPH L. MONTAGU, Oroville, Cal.

The most reliable method of determining the value of an alluvial deposit (without going to considerable

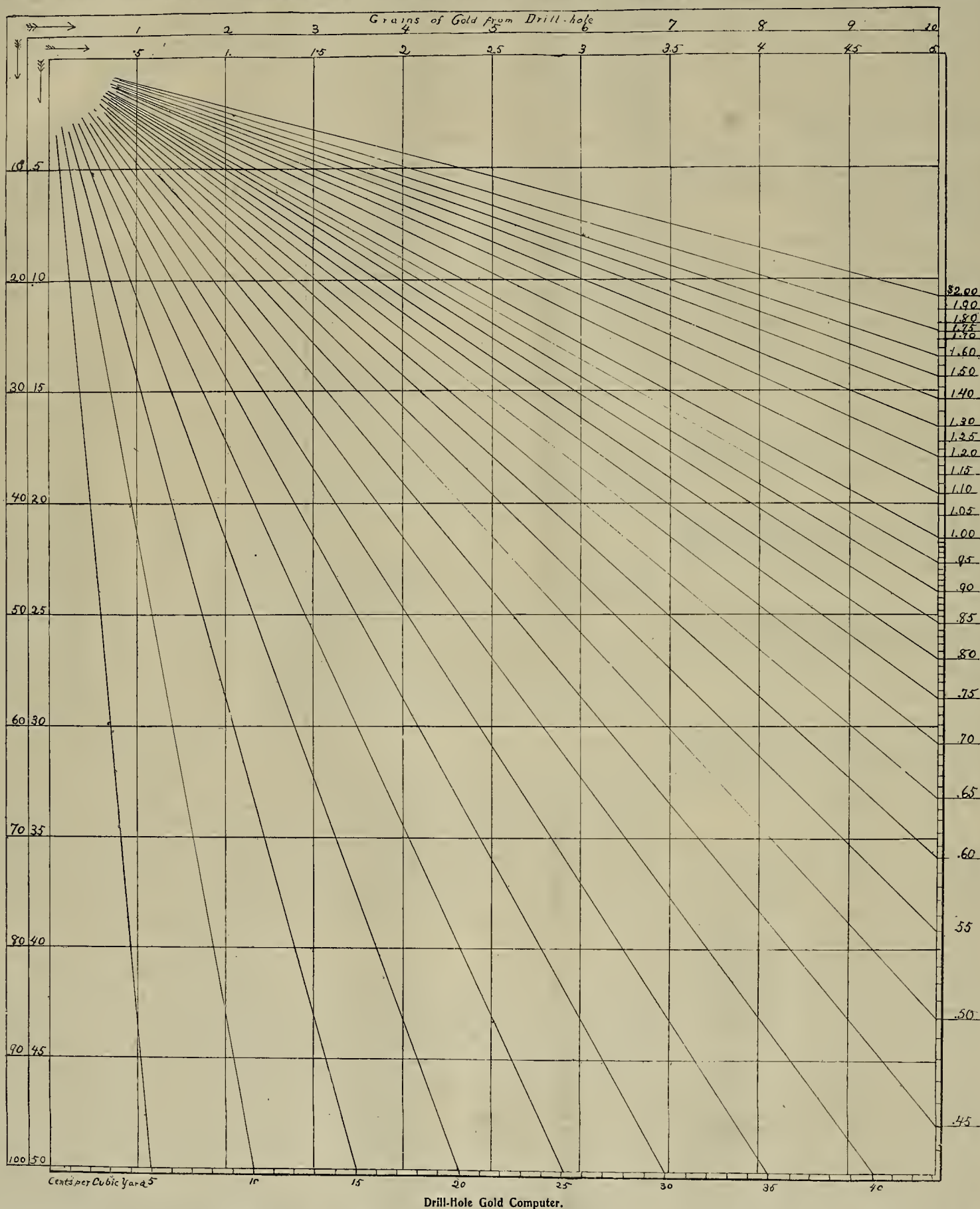
will be noticed that the depths of a drill hole and the weights of gold taken are in duplicate.

When using one row of figures representing depth, the row representing weight of gold indicated by the arrows should be used.

The object of having these duplicate values for depth and weight is to insure accuracy when the results from shallow holes are determined. In using

yard. From this value a deduction has to be made that depends on the fineness of the gold taken from the drill hole.

If the weight of gold from drill hole should weigh more than 10 grains the result—i. e., the cents per cubic yard—should be increased in proportion. For example, if in previous case there was 14 grains of gold obtained from the drill hole the result would be



expense) is by means of a drill. The value per cubic yard of the gravel penetrated by the drill can be computed by treating the gold obtained as that contained in a column of gravel the length of which equals the depth of the bore hole, and the diameter of which equals a certain factor depending on the size of drill used.

This factor, when a standard Keystone drill is used, is 7.035 inches: i. e., for every foot of depth there is .27 of a cubic foot (or .01 cubic yard) of gravel in the column.

In Fig. 1 I illustrate a drill hole computer that was based on the above factor and gold 1000 fine. It

the computer, the horizontal line representing the depth of the hole in feet is followed towards the right until it is cut by the vertical line representing the weight of gold taken from the hole. The diagonal that intersects this point gives the value per cubic yard of gravel penetrated by the drill (gold 1000 fine).

Example—A hole 60 feet deep, weight of gold taken from hole 7 grains: Taking the left-hand row of figures representing depth we find 60, and following this line to the right the vertical line representing 7 grains (top row) is met; the diagonal line that intersects this point represents 50 cents per cubic

increased thus: 7 grains : 14 grains :: 50 cents : \$1.

On the other hand, when the depth of hole exceeds 100 feet the result has to be decreased in inverse proportion. Thus, presume a hole 150 feet deep, 35 grains of gold from drill hole. Divide 150 by 3 = 50. Follow the 50-foot line until the 3.5 grain line is met, the value per cubic yard shown by diagonal is 30 cents; this has to be divided by 3, giving value of hole 150 feet deep, producing 3.5 grains of gold (1000 fine), 10 cents per cubic yard.

In determining the average value per cubic yard of a body of gravel the results to be of any real value must be arrived at systematically. The ground

should be divided into rectangles of equal areas, drill holes put down at the intersection of the dividing lines; and every value and every depth must be used in order to find the true average value per cubic yard of the deposit.

When depths and values have been found, the following formula will give the average value per cubic yard:

$$A. V. = \frac{(x_1 \times y_1) + (x_2 \times y_2) + (x_3 \times y_3) +, \text{etc.}}{(x_1 + x_2 + x_3 +, \text{etc.})}$$

When A. V. = average value per cubic yard; $x_1, x_2, x_3, \text{etc.}$, = depths of drill holes Nos. 1, 2, 3, etc., in feet; $y_1, y_2, y_3, \text{etc.}$, = value in cents per cubic yard obtained at drill holes Nos. 1, 2, 3, etc.

The total number of cubic yards in the deposit can be found by multiplying the number of acres in the claims by the figure that appears in Table I opposite the average depth in feet of the gravel.

Table II will be of some value to determine approximately the cubic yards contained in a cut or excavation. The first vertical column gives the width across face of cut; the other columns give the cubic yards per foot length of cut for various depths to bedrock.

Example—Cubic yards required in a cut 210 feet wide, 34 feet average depth and 600 feet long. In the vertical column under 34 feet the number 264.44 is found opposite to 210 (width of cut): $264.44 \times 600 = 158,666$ cubic yards contained in cut. This table can be used to advantage for checking up (approximately) the ground handled by a dredge in the course of a week.

TABLE I.
CUBIC YARDS CONTAINED IN AN ACRE OF GROUND OF VARIOUS DEPTHS FROM 10 TO 50 FEET.

Average depth to bedrock in feet.	Cubic yards per acre.	Average depth to bedrock in feet.	Cubic yards per acre.	Average depth to bedrock in feet.	Cubic yards per acre.	Average depth to bedrock in feet.	Cubic yards per acre.
10..	16,133.3	20..	32,266.6	30..	48,400.0	40..	64,533.3
11..	17,746.6	21..	33,880.0	31..	50,013.3	41..	66,146.6
12..	19,360.0	22..	35,493.3	32..	51,626.6	42..	67,760.0
13..	20,973.3	23..	37,106.6	33..	53,240.0	43..	69,373.3
14..	22,586.6	24..	38,720.0	34..	54,853.3	44..	70,986.6
15..	24,200.0	25..	40,333.3	35..	56,466.6	45..	72,600.0
16..	25,813.3	26..	41,946.6	36..	58,080.0	46..	74,213.3
17..	27,426.6	27..	43,560.0	37..	59,693.3	47..	75,826.6
18..	29,040.0	28..	45,173.3	38..	61,306.6	48..	77,440.0
19..	30,653.3	29..	46,786.6	39..	62,920.0	49..	79,053.3

50 feet average depth, 80,666.6 cubic yards per acre.

TABLE II.
CUBIC YARDS PER LINEAL FOOT OF A CUT.

Width of cut in feet.	Average depth to bedrock in feet.															
	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
120.....	88.88	97.77	106.66	115.55	124.44	133.33	142.22	151.11	160.00	168.88	177.77	186.66	195.55	204.44	213.33	222.22
130.....	96.29	105.92	115.55	125.18	134.81	144.44	154.07	163.70	173.33	182.96	192.59	202.22	211.85	221.48	231.11	240.74
140.....	103.77	114.07	124.44	134.81	145.18	155.55	165.92	176.29	186.66	197.03	207.40	217.77	228.14	238.51	248.88	259.25
150.....	111.11	122.22	133.33	144.44	155.55	166.66	177.77	188.88	200.00	211.11	222.22	233.33	244.44	255.55	266.66	277.77
160.....	118.61	130.37	142.22	154.06	165.92	177.77	189.63	201.48	213.33	225.18	237.03	248.88	260.74	272.59	284.44	296.29
170.....	126.19	138.51	151.11	163.70	176.29	188.88	201.48	214.07	226.66	239.25	251.85	264.44	277.03	289.62	302.22	314.81
180.....	133.33	146.66	159.99	173.33	186.66	200.00	213.33	226.66	240.00	253.33	266.66	280.00	293.33	306.66	320.00	333.33
190.....	140.74	154.81	168.88	182.96	197.03	211.11	225.18	239.25	253.33	267.40	281.48	295.55	309.62	323.70	337.77	351.85
200.....	148.14	162.96	177.77	192.59	207.40	222.22	237.03	251.85	266.66	281.48	296.29	311.11	325.92	340.74	355.55	370.37
210.....	155.55	171.11	186.66	202.22	217.77	233.33	248.88	264.44	280.00	295.55	311.11	326.66	342.22	357.77	373.33	388.88
220.....	162.96	179.25	195.55	211.85	228.14	244.44	260.74	277.03	293.33	309.62	325.92	342.22	358.51	374.81	391.11	407.40
230.....	170.37	187.44	204.44	221.48	238.51	255.55	272.59	289.62	306.66	323.70	340.74	357.77	374.81	391.85	408.88	425.92
240.....	177.77	195.55	213.33	231.11	248.88	266.66	284.44	302.22	320.00	337.77	355.55	373.33	391.11	408.88	426.66	444.44
250.....	185.18	203.77	222.22	241.11	259.25	277.77	295.29	314.81	333.33	351.85	370.37	388.88	407.40	425.92	444.44	462.46

Chemical Analysis of Igneous Rocks.

The United States Geological Survey is about to publish a work of exceptional importance to students of igneous rocks and to geologists who have an interest in these objects. It is entitled "Chemical Analyses of Igneous Rocks Published from 1884 to 1900, with a Critical Discussion of the Character and Use of Analyses," by Henry Stephens Washington, and it will appear as No. 14 of the series of Professional Papers.

As its title indicates, it is a collection of all chemical analyses of igneous rocks published within a period of sixteen years, going back to the time of the last compilation of the kind by Justus Roth, a German geologist. All igneous rocks are products of the consolidation of liquid or molten magma. They are sometimes glassy, sometimes partly crystalline, and sometimes entirely so. It is evident from observation that any particular magma which has been erupted from the depths of the earth, through fissures, to the surface, where it issued in lava streams, has consolidated in different places with many different textures; and it is also known of many magmas that the resulting rocks may have different mineral composition, when fully crystalline, according to the influence of environment upon the cooling masses. The chemical composition is, therefore, the most fundamental or constant character of all these products from the eruption of any magma.

The tables of Dr. Washington give nearly 3000 analyses of rocks, from all countries in the world. It is interesting to note that by far the largest number, and also the best ones, are from the United States. The author lays so much weight on the character of the analysis that he separates the good from the bad on certain principles, and publishes them in two parts. The good analyses, some 1600 in number, are arranged by kinds of rock, classed according to the recently published quantitative classification of igneous rocks by Cross, Iddings, Pirsson and Washington. The reason for using this new system is that the old rock names mean so little in regard to this fundamental feature of chemical composition that the analyses can not be grouped in the most useful manner under those heads. The new classification, being based on chemical composition very largely, is suited to bringing analyses of similar rocks together. Certainly, the examination of the tables of good analyses shows that rocks which have practically the same chemical composition have been called by a great many different names under the old style of classification; and of course the converse is true, that the analyses of any rock family under the old classification are distributed among a good many divisions of the system adopted. The analyses which are too poor to enable

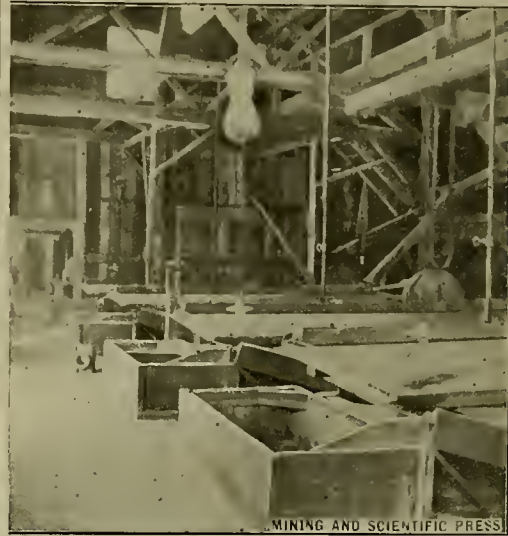
anyone to classify the rocks according to the new system are grouped in the second part, under the old names. By means of double and complete indexes, however, the author facilitates reference to all analyses of any of the older systematic rock groups, such as granite or syenite. The geographic index refers to all rocks of certain regions.

An interesting discussion of the value of accurate analyses of rocks to the science of petrography precedes the tables, and reviews the means of judging as to the quality of an analysis. The author enters an effective plea for careful investigation in this direction.

A New Mexico Copper Mine.

Written for the MINING AND SCIENTIFIC PRESS.

The plant of the Fraser Mountain Copper Co. at Twining, N. M., (see illustrations front page), consists of a 200-ton smelter and a 300-ton concentrator; also a converting plant and electric refinery. The entire works are operated automatically. Water is used for power as well as to carry the slag from the smelting furnaces. The Fraser Mountain mining dis-

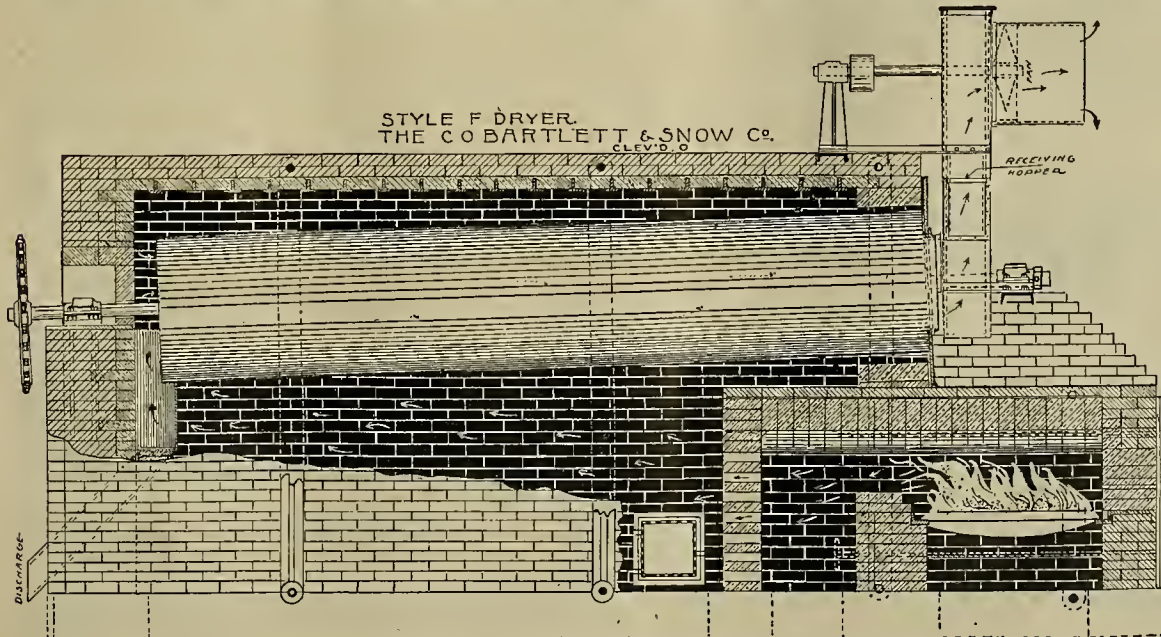


Interior Fraser Mountain Copper Co.'s Concentrator, Twining, New Mexico.

trict comprises some of the best gold and copper-bearing territory in Taos county, N. M. It is believed by some that gold was washed from the creeks of this section long before the Spaniards entered the old pueblo of Santa Fe. Desultory and intermittent mining operations have been carried on for the past twenty-five years. About ten years ago considerable excitement followed the discovery of gold at Amizette, about 2 miles below the Fraser Mountain mine on the Rio Hondo. The Fraser Mountain mine is now one of the large producers of New Mexico. It is claimed this is the only plant in the United States making a copper carbonate concentrate. The formation is a mica schist, and the specific gravity of the copper being greater than that of the gangue, concentrates readily.

The company owns 800 acres of mineral land, beside a millsite and other lands in the district. The principal vein is from 50 to 60 feet wide, and may be traced by the outcrop for more than 1000 feet. R. McCalmont is president, W. Fraser is general manager, and F. J. Buck of Denver, Colo., consulting engineer.

The Bartlett & Snow Dryer.



The accompanying illustration is that of the Bartlett & Snow style F dryer, single cylinder rotary, which they have lately installed for Wood & Swart in their zinc works at Benton, Wis., and also at the Payne Consolidated Mining Co., Sandon, B. C. The dryer has a capacity stated to be up to four tons of concentrates per hour. The products of combustion pass first around the cylinder, then through it, that is, through the material that is being dried. When desired, a dust chamber is furnished. They report having a very large sale in this kind of a dryer, which is specially adapted for concentrates, being of medium weight and also medium price, simple in construction and can be fired with coal or wood as preferred. It can also be fired at the front or at the side, whichever is desired. It is manufactured by the C. O. Bartlett & Snow Co. of Cleveland, O.

The mine owners of the Witwatersrand are jubilant over the discovery of extensions of the known limits of the auriferous hanket.

Automatic Tailings Sampler.

Written by C. H. PEAD.

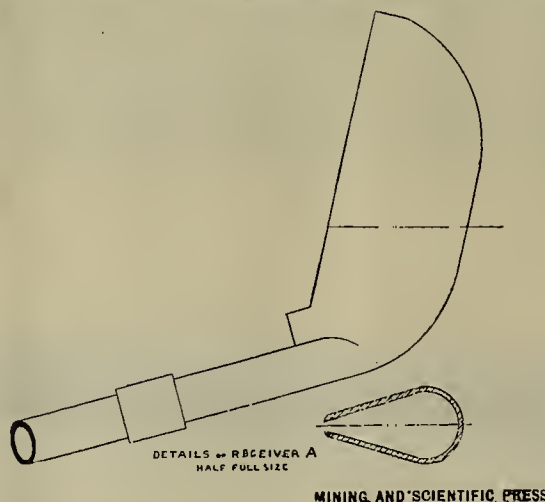
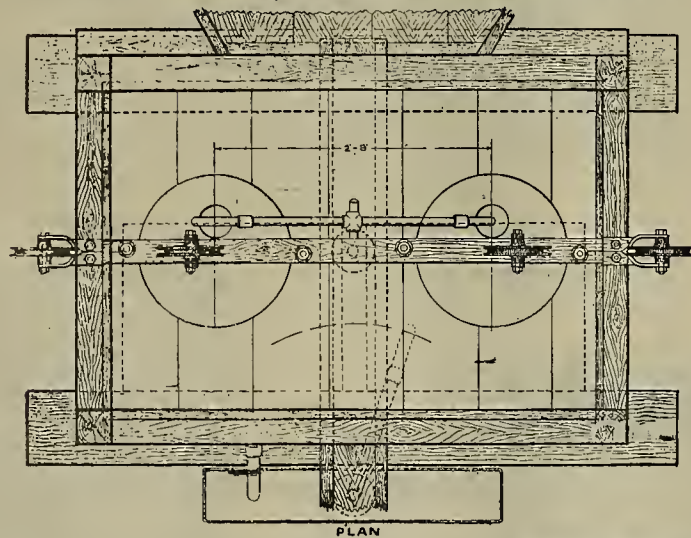
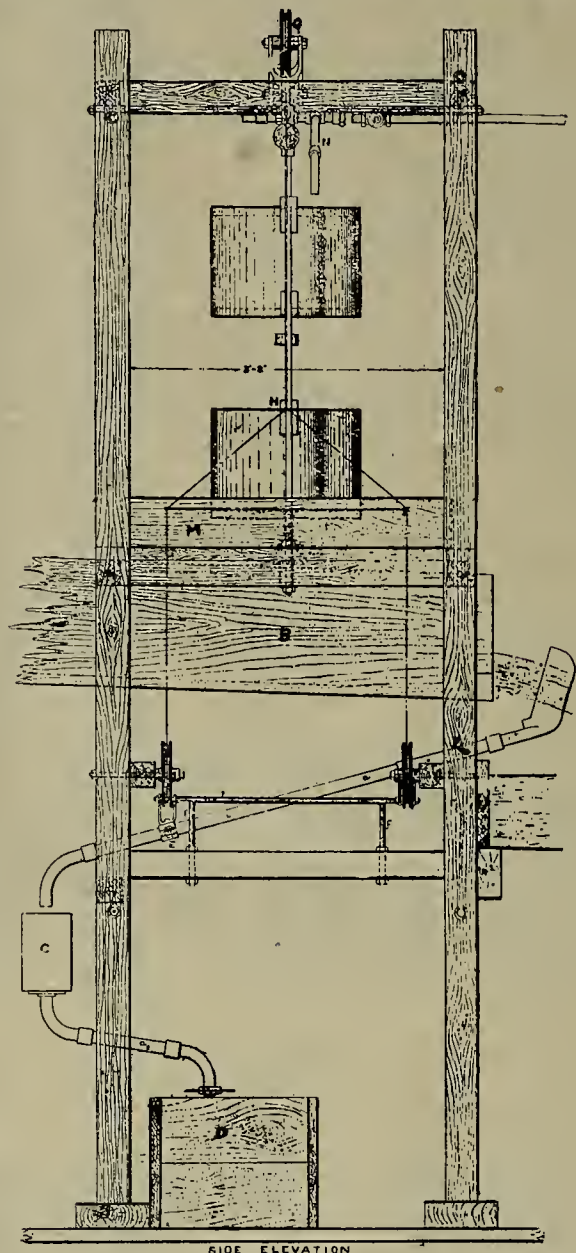
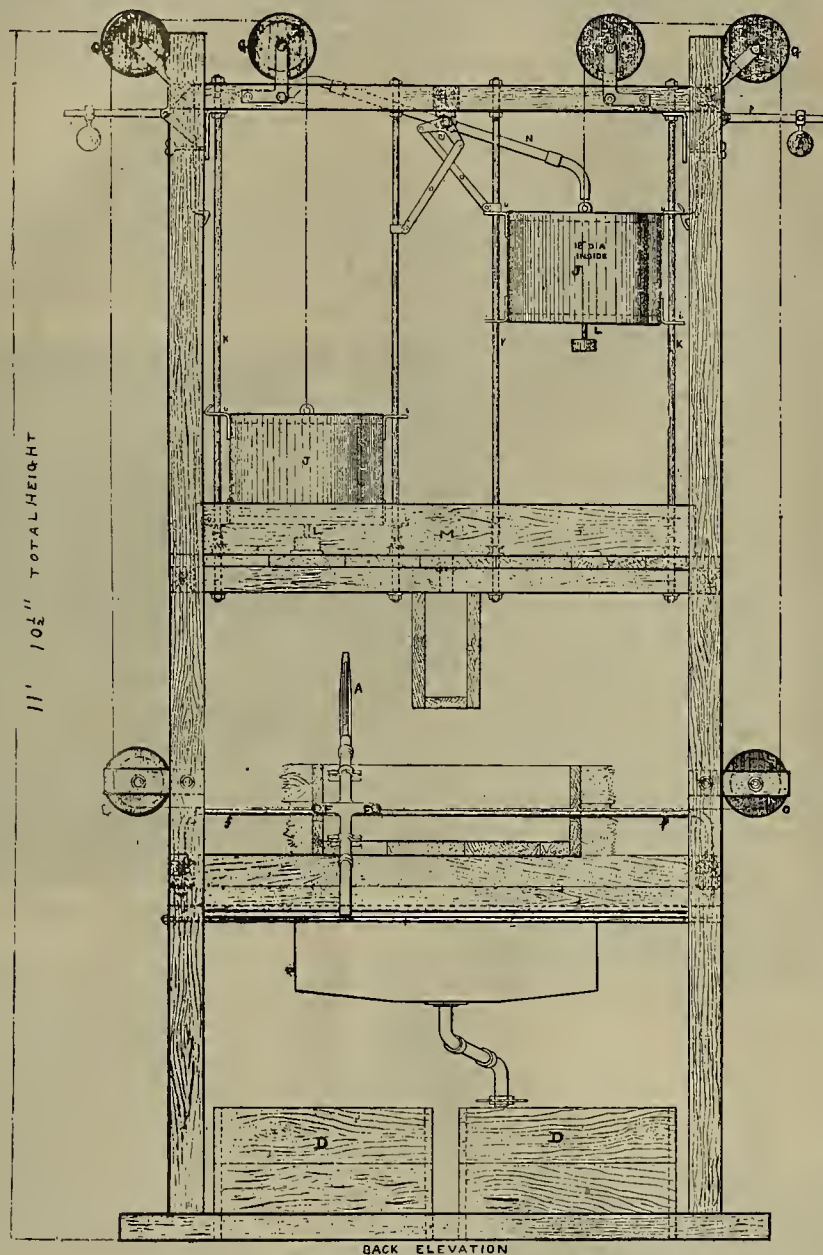
In 1887 I designed and erected an automatic sampler which I have used since with good results. It has been but little trouble to keep in running order, and about six months ago I made improvements in

It is necessary that the slot formed in the receiver A should extend above and below the stream being sampled and that it should be of even width throughout. The receiver A should pass at least 6 inches beyond the launder B, to prevent anything splashing into it when at rest.

The pipe aa is held rigidly by the brackets EE to the iron rods FF, which lie upon, but are not fastened

They are also perforated over a diameter of 6 inches at the bottom, this area being closed by the valve at L. The latter is automatically opened when the cylinder falls by striking the bottom of the box M, where a rubber cushion is fixed to deaden the stroke. The valve also closes itself automatically by its own weight as the cylinder rises.

On the bottom of the rods KK springs or rubber



Automatic Sampler for Tailings.

the mechanical construction which have overcome certain slight faults. The description is as follows, and is illustrated by the accompanying drawing:

A is the receiver or utensil that takes the sample of the pulp running from the launder B, and consists of a slotted iron vessel, the construction of which is difficult to describe, but is plainly shown in the sketch. At the lower end it is fitted with a 2 1/2-inch pipe aa, which carries the sample to the second receiver C, and from there through a₂ to the settling boxes DD.

to the cross rods ff, but run along them connecting the pipe aa with the receiver A when the sample is taken.

The rods FF are now run over ff on small wheels, which arrangement I find to be an improvement; the sketch not showing this alteration.

Connected with each side of the brackets EE are wire ropes which are led under the lower pulleys GG, are joined at H, and from there being led over the upper pulleys GG are attached to the cylinders JJ.

The cylinders JJ are fitted with guide pieces top and bottom ii, which run on the vertical rods KK.

cushions are placed to deaden the shock of the falling cylinders.

The cylinders are filled with water led through the pipe N, which is hung on a free bearing and is tilted towards each cylinder as it rises by means of the link gear shown at O.

The water discharged from the cylinders runs out through the valve at L into the box M, and from there may be led into the launder B beyond the receiver.

I have found that samplers operated by water have a tendency to hesitate when the weight of the stream being sampled strikes the receiver. To overcome

this I have introduced the releasing catch P, fitted with a thumb screw and with a movable weight. By means of these latter the catch may be so regulated that the receiver is made to travel at an even speed through the stream to be sampled, and more quickly or slowly as may be thought best.

Two settling boxes for receiving the sample, when taken, are shown. The pipe a_2 which feeds them is movable, and is turned by hand from one box to the other as required. This enables the sample to be thoroughly settled before the superfluous water is drawn off and the settled sample removed.

The advantage this sampler has over others that I have seen are that the receiver travels horizontally in a straight line across the stream, and is so constructed as to take a sample from every point of the stream in its passage; also that it travels at an even speed throughout its passage, and may be regulated to travel fast or slow.

I have also found that the falling cylinders and ropes are cleaner and more reliable than the tumbling box and levers.

Vibration in Batteries.*

Written by B. WAITES.

The theoretical position taken upon this question, and the base, or data, from which all following notes should be discussed and criticised, is that the maximum vibration of batteries which in practice should be considered and recognized as allowable and irreducible is what may be termed the "earth vibration," consequent upon the continuous dropping of heavy stamps at the highest practicable rate of speed. Vibrations resulting therefrom would be analogous to the vibrations experienced on the passing of a heavy railroad train, or the working of a steam hammer. The intensity and area of this vibration would be determined by: (a) The number of stamps running; (b) the weight of the stamps; (c) the number of drops per minute. In battery construction and erection the attainment of this minimum of vibration should be practically possible, and, therefore, no other working conditions of any battery should be recognized as being either satisfactory in its nature or first rate in quality.

The point from which this question is approached is that of considering the possibility of providing and erecting a structure upon foundations that would ensure a stability and steadiness of working conditions equal to the theoretical requirements previously stated, and also of providing some effective and economical method of reducing excessive vibration in batteries already erected and running.

A practical and economical way of immediately reducing excessive vibration of running batteries would be found in the following method, i. e., excavate between the mudsills immediately below the king posts, place upon a good stone bed a block of teak or other durable wood, clear away from the under side of the streaksill all soft or decayed wood until a good, sound surface is obtained, leaving a sufficient space between the prepared under side of the streaksill and the top side of the teak block for a good pair of "fox wedges;" these wedges could then be fitted and driven home until the foundations of the king posts were as firm as it could be desired to make them. If a space between the mudsills could be kept clear of silt and sands, these wedges could be tightened when required. A much better result could be secured by fixing a weighted lever behind the head of the top wedge, so that the automatic action of the lever would act upon the wedges and keep the foundations of the king posts constantly firm. The difficulty of operating in this manner upon the streaksill carrying the middle king post in any battery of ten stamps, as usually erected, will be sufficiently obvious, but the two mudsills on either side of the pile blocks could be so fixed in the manner indicated as to materially reduce any vibration if the state of the battery should imperatively demand some remedy. Stamp mills erected in batteries of five stamps each could be more easily dealt with in the manner described than mills erected in batteries of ten stamps each.

Having briefly indicated one method of reducing excessive vibration, which I have experimentally proved to be effectual, I will now endeavor to deal with the problem of providing the foundations for and erecting a structure which, so far as the question of vibration is concerned, should be a theoretically perfect mill. Assuming the thickness of the pile blocks at the top—i. e., the seat of the mortar boxes—to be 30 inches, the present practice of putting down parallel blocks gives the manifestly inadequate area of the mortar boxes—i. e., 5 feet by 2 feet 6 inches—as the foundation of an anvil bearing the impact of five stamps of say 1150 pounds each, and each stamp striking about 100 blows per minute. The parallel form of pile block, in view of the fact that more or less "canting" of these blocks occurs in running practice, may fairly be regarded as being obsolete. The true form of the foundations carrying the mortar boxes and receiving the force and impact of 500 blows per minute of 1150-pound stamps will be found to be of a tapering form which will allow of a

much increased area of bed. The material of such improved pile blocks may be of either iron or wood, which would be determined by the position of the millsite and the conditions of transport. Such a pile block, instead of being 5 feet by 2 feet 6 inches at the bottom, as now obtains, should be at least 5 feet by 6 feet 6 inches. Such form of pile block by reducing the liability of canting would also reduce the possible liability of vibration which would be caused by the jar of the canting block upon the mudsills, or the girts between the king posts holding the pile blocks in position.

The present style and form of foundations provided for the king posts of existing batteries on the Rand are, in my opinion, the chief causes of excessive vibration of the whole structure of a battery. Plainly stated, the foundations provided for the king posts ought not to be in any sense inferior to what is provided for the mortar boxes, and the present form of mudsills and streaksills can only be compared to the bird cage structures which the builders of railways use for the purpose of carrying their temporary bridges, etc.

Any foundation provided for the king posts of a battery ought to be of such a quality as to make it possible for the mill manager and the mechanical engineer to experiment with stamps up to and perhaps exceeding the weight of 2000 pounds each, in the full confidence that any weight of stamp up to that limit could be placed upon the foundations provided for the king posts, and work with the absolute minimum which has been termed the irreducible earth vibration. It may be accepted that the foundations of the king posts of batteries erected and running on the Rand do not fulfill the theoretical requirements with regard to this question of vibration with stamps ranging from 950 pounds to 1150 pounds in weight. The true form of foundations for king posts will in the future approximate to what has been before described as the true form of foundation for pile blocks, i. e., separate from and independent of the pile block foundations. They should go down to the same bed level, and be finished off at the same level as the top of the pile blocks. Any king post or its foundation would then be as easy of access as the mortar box, and by the simple removal of the tables the foundations of the pile blocks and the king posts could be examined and repairs done if required. The material forming this king post foundation could be either wood or iron, as transport conditions might decide. The streaksill would be utilized as a knee beam, and accuracy of position maintained by bolts, as is done higher up the king post. The mudsill in front of the line of pile blocks and king posts would be abolished, and the section of the timbers of a battery structure might be considerably reduced.

To summarize, the solution of the whole problem of this question of vibration of batteries lies in the nature and quality of the foundations provided for the king posts and for the mortar boxes. Such alterations and improvements in these foundations would not be more expensive during the life of the battery, as the more perfect conditions of running that would be attained would most materially increase the efficiency of a battery or the duty per stamp per day, and would also materially reduce the cost of maintenance during the whole period of the estimated life of a battery, and the highest attainable point of efficiency ought to be the only admissible standard of judgment.

Emerald Mines in Colombia.

Consul-General A. M. Beaupre of Bogota thus states the conditions prescribed by the Government for the presentation of bids and for the leasing of the Muzo and Cosquez emerald mines. These mines, the property of the Colombian Government, are to be leased to the highest bidder, the proposals to be received by the Government on Dec. 31, 1903. To be admitted as a bidder it is required:

"Not to be in debt overdue to the National Treasury, the fact to be established by a certificate issued by the Treasurer of the Republic.

"To produce the sealed proposals addressed to the Minister of Finance before 10:30 A. M., Dec. 31, 1903.

"To add a certificate of the Treasurer-General stating that the bidder has deposited in the National Treasury in American gold or in drafts on London, Paris or New York, payable, at most, after thirty days' sight to the order of the same treasurer and backed by a respectable bank in Bogota, or by receipts from the Credit Lyonnais, London Bank, or Union Bank, if the bidder is a foreigner, the amount of \$50,000 required as a guaranty against bankruptcy.

"To present a signed statement, accepting, without any restriction whatsoever, the stipulations. The minimum monthly rent shall be \$30,000 American gold for the ten years' lease. Proposals which do not cover this amount shall not be admitted. At all times the Government reserves to itself the right to inspect the mines, in order to prevent damages, and the liberty to declare the contract null and void by reason of said damages. The Government may occupy ipso facto said mines without applying to the judicial authorities, and even by having recourse to force."

It may be that there are those in the United States

who would be willing to gamble on emerald mines to the extent required in the above statement, but the average investor would require to know particularly what the stipulations were, and some objection might also be raised to the last sentence in the statement, to the effect that the Government may occupy the mines at any time without applying to the judiciary, even by recourse to force.

A New Crucible Furnace.

The Turner gasoline crucible furnace herewith illustrated is manufactured by the Turner Brass Works, 53 North Franklin St., Chicago, Ill., and presents many features of special interest to those connected with the mining industries.

This outfit consists of the Turner crucible furnace



New Crucible Furnace.

proper and the Turner gasoline blowpipe, together with crucible and tongs. It is very compact, portable, and can be used where gas and electricity can not be obtained.

It will be noticed that the gasoline blowpipe which supplies the heat is controlled by two valves, one of which regulates the air blast and the other the gas. In this way the operator has perfect control of the blowpipe, and the air and gas are mixed in the exact chemical proportions to produce perfect combustion; thereby is secured the maximum heat possible to obtain from gasoline.

This improved method of securing heat from gasoline produces a flame of absolute purity and is unexcelled for the most delicate chemical operations which can not be performed by the ordinary furnaces on the market, owing to the presence of sulphurous gases and other impurities.

Substances which resist the ordinary methods of reduction can be fused with ease, and the heat supplied by the blowpipe is far beyond what is required for most purposes. The black lead crucible holds about ten ounces of gold.

Every part of this outfit is made of the best material, and special care is used to make it produce the highest degree of efficiency.

When set up ready for use it occupies a space of only 5x12 inches, and packed ready for shipment weighs but 15½ pounds. It is nickel plated and presents a handsome appearance.

THE twentieth annual convention of the American Institute of Electrical Engineers is to be held at Niagara Falls, N. Y., June 29 to July 3. A large number of technical papers will be read at the meeting, among them one by Ralph L. Montagu, "The Electrical Equipment of the Gold Dredge"; "Some Notes on Certain Underground Hoisting Problems on the Witwatersrand," by A. W. K. Pierce, and "The Operation and Maintenance of High Tension Underground Systems," by Philip Torchio. These are the only papers thus far announced which relate particularly to mining.

ABOUT 247,000 tons of steel fly away in dust from the railroads of the world yearly, according to tables submitted to the mining and smelting section of the International Chemical Congress now in session, by Dr. A. Haarman, of Osnabruck, says the American Manufacturer. Of this amount 19,000 tons is lost through friction in the German railroads alone. The experience of Europe, it was also announced, had now demonstrated that iron ties are as cheap as wooden ties.

*Trans. Assn. Mech. Engs., S. A.

The Mining of Diamonds.

Written for the MINING AND SCIENTIFIC PRESS.

No branch of the mining industry is surrounded with more of romance, or with more of that element so dear to the heart of the miner—excitement—than that of diamond mining. Dame Fortune is as fickle in the diamond mines as she is elsewhere. The chance discovery of a diamond by a child, playing in the dooryard of a Boer farmhouse, eventually led to the opening of the wonderful mines of De Beers, Kimberley and other deposits. The entire history of the diamond mines in every phase of their development is one of evolution, from simple, crude methods to the perfected, scientific manipulation of to-day. The diamonds were first washed from the alluvial deposits along the Vaal river and adjacent low rolling hills. Eventually the source of the diamonds was discovered to be in vents, through which the dark, basic rock containing the precious stones was forced from below. These vents are rudely circular or oh-long in form. Each crater or vent was laid out in claims of about 31 feet square each. In the early history of the mines, no consolidation of a greater number of claims than five was permitted. As depth was gained in digging out these large deposits, several hundred feet in diameter, the claims became clearly indicated by the variable progress of work on the several holdings. Those which proved rich were usually worked with more energy than claims which proved less remunerative, and soon there was great discrepancy in the height of these blocks of ground. Roads were left crossing the tract, but as the holes grew deeper, the rock caved along the roadways and these thoroughfares, already as narrow as they could be and still serve their purpose, became useless. Finally the roadways were mined and then resulted in the ingenious system of wire tramways, reaching from the rim of the crater to the individual claims, of which there were several hundred. These hoisting rigs with their wire ways extended entirely around the rim of the craters at the several mines. In time the hoisting arrangements were built "three stories" high, the lower hoists operating those claims nearest the rims, the second tiers of hoists served the same purpose for intermediate claims situated farther from the rims, and the uppermost tier worked the center. Despite the heavy caves of rim rock into the constantly deepening craters, excavation was carried on until the bottoms of the great pits were from 400 to 500 feet deep. Eventually the caves of rim became so large and so disastrous that the method of open-pit mining was abandoned, becoming too expensive. The system of hoisting from the pits went through the various stages of improvement, the same as mining and treatment of the diamonds. At first the "yellow" dirt was shoveled into carts or hand harrows and hauled or carried away along the roads, later windlasses were put in to work the deepening diggings. Then horse whips were introduced, which were finally followed by steam hoists. The first shafts were sunk in the bottoms of the pits themselves; later, shafts were sunk out in the rim rock at considerable distance from the craters. Some of these were vertical, some were inclined. After many years of expensive work as individual claims or as small consolidations of a few claims, it became evident that only by consolidation could the mines be operated at all, and large companies were formed. Finally these were consolidated as the De Beers Diamond Mining Co., which controlled all the mines of South Africa, and those of Brazil as well.

Not less interesting was the recovery of the diamonds. Those at first found were loose in the gravel and sand found on the low, rolling hills of the veldt. Later, when the vents were discovered, the ground near the surface was soft, oxidized and yellow in color. The harder lumps were easily pulverized with a blow of a pick or a shovel, but gradually the rock became more firm and darker in color until the "blue ground" was entered below the oxidized zone. Here the rock was hard and had to be blasted out. It was found, however, that upon exposure to the air it disintegrated. It was also discovered that alternations of rain and sunshine caused the disintegration to proceed rapidly. Large "floors" were prepared on the semi-desert plain. Suitable locations were selected, the brush and grass removed, the ground leveled, sprinkled and rolled by heavy machines. The blue ground is now conveyed to the floors, which cover hundreds of acres, by means of steel cars with mechanical rope haulage, and branching tracks traverse the floors. The diamondiferous rock is dumped on the floors, where it often lies for months during the process of disintegration. This is sometimes facilitated by sprinkling, but of course this can only be accomplished in a limited manner, due to the scarcity of water and the vast extent of the floors. This disintegration is further aided by harrowing the ground. This process has also been greatly revolutionized and improved. Originally done by hand, it is now done by traction gang plows or by stationary engines hauling plows back and forth across the field.

Diamonds are of relatively high specific gravity,

and are separated from the gravel, the soft yellow ground or the disintegrated "blue" by washing. In the process of concentration, not only diamonds but other minerals of high specific gravity are separated from the gangue. These are pieces of iron ore, garnets, etc. The final separation has been done by hand by expert pickers. The method now in vogue is as curious as it is effective. There would doubtless be a disposition on the part of many to apply the test to the method here described were the material available, but there are few who have diamonds lying about in the gravel of their dooryards, for such experiment. The discovery was made by a young man named Kersten, who was employed in the sorting room at Kimberley.

One day, by the merest accident, he made the discovery. A rough diamond and a garnet happened to be lying on a small board on the bench where he was working. He happened to pick up one end of the board when the garnet slipped off, but the diamond remained.

This was a phenomenon worth investigating. Kersten found that there was a coating of grease on the board which had retained the diamond, while the garnet had slipped off.

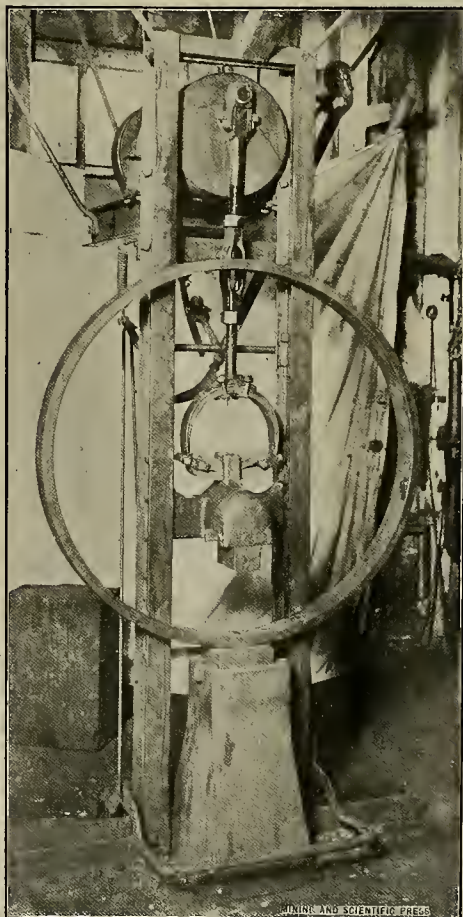
He procured a wider board, coated one side of it with grease and dumped a few handfulls of concentrates on it. Then he found that by holding the board in a slightly inclined position and vibrating it, all the concentrates except the diamonds moved to the lower end and fell off, while the diamonds remained in place.

Then he invented a machine by which his discovery might be utilized. One part of his machine was a slightly inclined table coated with grease and vibrating when the machine was in motion. Another part was a sort of hopper through which the concentrates, with a small current of water, passed to the surface of the vibrating table. Considerable study was required to perfect the apparatus, but at last the machine was completed and the diamond men were invited to witness the new method of separating diamonds from the rest of the concentrates.

The invention was an entire success. All the garnets and other minerals that are not wanted pass over the surface of the table, while every diamond, large or small, is retained.

The Griffiths Automatic Hammer.

In mining blacksmith shops heavy jobs are more or less frequent. This work is more often done by an extra helper or so (as the case may be), being required. Power is usually at hand, but means for



The Griffiths Automatic Hammer.

applying such is lacking. The Griffiths automatic hammer, herewith illustrated, is a machine calculated to fill these requirements, simple in construction and easy to manipulate. The hammers are being built in weights of from 50 pounds

to 500 pounds. The rapidity of the stroke is regulated by the size of the pulley, and also by the pressure of the idler pulley (seen back of upper right-hand corner of frame) on the driving belt. This idler is operated by the foot pedal shown in front of the anvil base. Because of this pedal arrangement one man can readily handle the piece of work and attend to the machine at the same time. The semicircular steel springs and the leather cross-straps connecting through the top of the hammer permit of a variable length of stroke. The turnbuckle on the crank arm will accommodate the machine to pieces of work up to 6 to 12 inches in height; and for greater heights (as in the case of "upsetting"), the anvil face can be lowered, the anvil block being built in sections. It is well adapted for all kinds of welding and drawing work. The accompanying cut shows a wagon tire in position for welding. The machine is self-contained and built of flexible steel I beams. T. H. Griffiths, No. 85 Fremont street, San Francisco, Cal., is inventor and sole manufacturer.

Compressor Explosions.

A great deal has been written of late in regard to the causes which lead to explosions of air compressor cylinders. In fact, this subject formed the basis for a most interesting discussion which took place at a recent meeting of the American Institute of Mining Engineers. Few accidents of this kind have ever happened on the Pacific coast, and it is only natural that they should excite more or less interest when they do occur. Therefore, the recent accident at the Fremont mine, near Amador City, Cal., unfortunately causing the death of the esteemed superintendent, C. E. Purrrington, opened the door for considerable conjecture as to the cause, which has only now become known. The machine is a 20½x24-inch duplex Ingersoll-Sergeant air compressor, and, knowing that an accident of this kind might be used as an argument against this make of machine, the manager of the Fremont Con. Mining Co., Arthur Goodall, wrote the following letter, under date of June 14, to Messrs. Harron, Rickard & McCone, the agents on the Pacific coast for the Ingersoll-Sergeant Drill Co.:

MESSRS. HARRON, RICKARD & MCCONE,
San Francisco, Cal.,

GENTLEMEN:—

In justice to you, as agents for the Ingersoll-Sergeant Drill Co., it appears to us only proper that we give you a statement of the cause of the exploding of one of the cylinders of our 20½x24 inch duplex Ingersoll-Sergeant air compressor on the morning of Saturday, June 6. The accident was due to the closing of the discharge valve while the machine was in operation.

You are at liberty to use this letter as you see fit.

[Signed]

ARTHUR GOODALL,
Manager Fremont Con. M. Co.

Mexican Duty on Explosives.

Going into effect July 1, a number of new rates will be effective in the Mexican customs department, says the Chihuahua Enterprise, covering the duties on certain articles imported into Mexico. Among these is a change in the rates of powder. The new ruling provides that dynamite and industrial explosives entered through the custom houses of the republic, or manufactured in the territory of the republic, will pay \$210 per ton. Exemption from said tax may be allowed in the case of common gun powder, black blasting powder for mines, and gun powder for fireworks or for hunting purposes, in the composition of which the only ingredients used are sulphur, carbon and the nitrates of soda and potash, and not nitro-glycerine, chlorate of potash or other chemical explosive.

German Inquiry for Red Zinc Ore.

Consul E. A. Man, of Breslau, Germany, May 19, 1903, reports that he has an inquiry from a prominent local firm dealing in metals, ores, etc., for large quantities of red zinc ore, regardless of whether it is calamine, galmei or blende, or what percentage of zinc it may contain, the important requirements being that it shall possess a purely natural red coloring. Anyone who can furnish such ore is asked to communicate with the consulate.

ALTHOUGH the expenditure occasioned by the war in South Africa is so much dead loss, says the South African Miner, the period was not altogether lost for some ventures. The Orange Free State and Transvaal diamond mines, for instance, had done little more up to the beginning of the war than haul blue ground on to the floors. The result is that they have now 200,000 loads weathered and ready for washing. This working has now been begun on a scale limited by transport and native labor. A good average of stones has been recovered.

THERE are places where cyaniding is in progress and the extraction of values reaches or exceeds 80%, but owing to the original high value of the ore the tailings are still worth \$2 and over per ton, which in the future will be saved, but which in the haste of making large tonnage and quick profits are now allowed to escape.

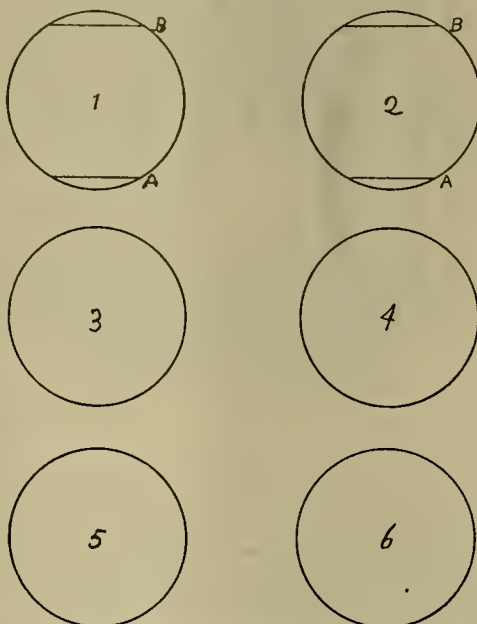
Cyaniding in the Black Hills, S. D.

Written for the MINING AND SCIENTIFIC PRESS by
J. B. EMPSON.

The ore which is at present being treated at the Dakota Co.'s 30-stamp wet crushing mill is of a quartzite nature from the Cambrian or Potsdam formation, the values in which are presumably mostly carried along the cleavage planes, allowing of a fairly coarse crushing. The ore is very hard, carrying about 80% silica, a small amount of iron, mostly in the form of ferric-oxide, and about 3% to 4% of sulphur, probably in combination with some of the iron in the form of a very fine pyrite. Alumina, calcium carbonate and magnesium oxides are present in small quantities. The ore occurs in flat bodies of large extent, lying one above the other, with beds of shale or sandstone between. The ore at present being mined is taken from the surface and is mostly low grade, carrying approximately equal weights of gold and silver. Most of the mining is done by means of "open cuts," as the ore lies in large deposits within 18 feet of the surface of the ground. The actual cost of mining the ore and loading it into cars is 90 cents a ton. The ore is hauled by the railroad 10 miles to the mill in Deadwood at a cost of 75 cents a ton. On arriving at the mill the ore is dumped from the railroad cars into three storage bins of a capacity of 200 tons, from which it falls by gravity to a No. 4 Gates crusher, which breaks it to pass a 2½-inch to 3-inch ring. The ore is then raised by means of a bucket elevator 42 feet to the battery bin, holding 300 tons, whence it falls by gravity to six automatic suspended Challenge feeders, and is fed to the stamps, thirty in number, with a 9-inch drop and ninety drops per minute. Stamps are in units of ten. Blanton cams are used. The mortars are of two patterns, four being the double-discharge silver mill mortars and two being of the Homestake narrow fast-crushing type. It was found that in using the double-discharge mortars with a fairly coarse screen that, unless the volume of solution passing was much increased, the solution would get out of the mortars without carrying with it the proper amount of sand, consequently lessening considerably the capacity of the mortar. On this theory the back of the mortar was closed up with a sheet of steel plate ⅝-inch thick and the mortar used thereafter as a single-discharge. Screens in use are approximately 6-mesh (wire .054); size of opening, .113 of an inch. Depth of discharge is kept about 4 inches. Volume of solution passing is about in the proportion of 4 to 1. The ore as it falls into the mortars is met by a stream of cyanide solution in strength 0.10% KCy. As the pulp leaves the mortars it flows by gravity to two hydraulic classifiers, in which the slimes are eliminated from the sand, the first box being a spitzkasten and the second box a combination of spitzkasten and spitzluten. The sand issuing from the bottom of the classifiers is pumped by means of two Frenier spiral sand pumps (10x54-inch), placed one above the other, to a height of 34 feet, whence it falls by gravity to the sand vats, six in number, 10x20 feet, holding 150 tons each. The sand is evenly distributed in the sand vats by means of Butters & Mein distributors, made of wood, with sheet iron curves. Overflow from rim of sand vats goes to slime vats. The sand as it is deposited in the sand vats gives the following sizing results: On 10-mesh, 12.7%; on 20 mesh, 31.3%; on 40-mesh, 28.2%; on 100-mesh, 20.3%; on 150 mesh, 1.6%; on 200-mesh, 2.4%. Before the sand is charged into the vat the vat is filled with solution, so that overflow and separation of slime commence at once. The vat when filled is allowed to drain slowly for three hours, then barren solution of 0.10% KCy is applied from the top and allowed to soak through. Towards the end percolation is increased, until finally, when the wash waters are applied, the valve is wide open. Treatment lasts five days and then residues are sluiced out.

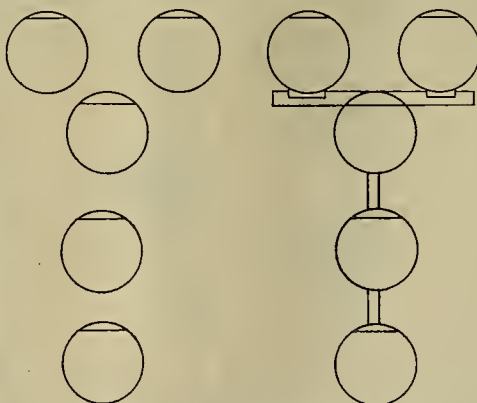
The overflow from the classifiers, consisting of approximately 20% of the total weight of the ore, is divided as follows: 91.2% amorphous slime, 1.20% remaining on 100-mesh, 2.20% on 150-mesh, 5.40% on 200-mesh. This overflow goes to a small centrifugal pump, by means of which it is pumped to the slime vats, where it meets the overflow from the sand vats. The slime and solution as they enter the slime vats flow down behind a baffle partition (A), about 6 feet long, and extending downwards within 3 feet of the bottom, cutting off a segment of the vat. By means of this the slime settles from the bottom upwards, in place of from the top downwards. As soon as vat is full of solution, an overflow (B) commences opposite the intake of clear solution, which goes to a sump and from thence is pumped back to supply the batteries. Slime is allowed to run into No. 1 vat for twenty-four hours, then the gate is closed and the same process is carried on in No. 2 vat, and No. 1 vat is left undisturbed for two hours. Then syphoning of the clear solution from the top commences. This solution is absolutely clear and goes direct to the gold sump and from thence to the extractors. As soon as No. 1 vat is syphoned down to the slime and the economic point of settling is reached, taking on an average about twelve hours, the syphon is raised and "barren" solution is added by means of a pump and a 2-inch hose; at the same time the plug on the bottom is lifted, allowing connection with a No. 4 centrifugal

pump, by means of which the barren solution and slime are agitated and pumped into vat 3. Proportion of solution to dry slime after decantation is approximately 40% solution and 60% slime. Equal volume of barren solution to the wet slime is added. No. 3 vat, when full, is allowed to settle and clear so-



Arrangement of Cyanide Tanks, Dakota Mill.

lution decanted to battery sump. The remaining slime is pumped into No. 4 vat, with an equal volume of solution "barren," and once more decanted to battery sump. The slime is mixed with water, pumped to No. 5 or No. 6 vat and allowed to settle as long as time will permit. Wash water is used in sufficient quantity, according as it is needed, to keep amount of solution constant. Slime from No. 5 or No. 6 vat, after being settled as long as possible, is run to waste. Assays show an extraction of 85% of the value of the ore on the washed slime, but the actual recovery is about 79%. This difference is accounted for by the impracticability of perfectly washing the final slime. The average extraction for twelve months was 82%, with an actual recovery of 79.8%. Zinc shavings are used as a recovering medium, and practice has shown that it is necessary to put through 33% of the total solution used. The extractors used are of the individual box type, making an arrangement which is easily cleaned up and supervised. The extractors are worked on the principle that 90% of the extraction or precipitation takes place in the top tubs; hence the idea is to run a slow stream into the top tubs and increase the flow in the lower tubs, thereby handling a larger bulk of solution



Arrangement of Precipitation Barrels, Dakota Mill.

to greater advantage. B. C. Cook of the Portland mill, South Dakota, was the first to install this principle. Precipitation, as a rule, is satisfactory throughout the district. The tubs as used are made of barrels—those formerly used for spirits are the best, owing to their being stronger than the usual barrel. Two cleats (iron) are bolted to the side of the tubs, and, when necessary to clean up, an iron yoke is fastened to them and they are lifted and carried by means of overhead gear straight to the clean-up tank. The usual clean-up appliances are generally in use—refining of precipitates with sulphuric acid and fluxing of residues in graphite pots in a wind furnace. Consumption of cyanide per ton of ore is two-thirds of a pound, and this seems about the usual consumption in the district. Consumption of zinc is .75 of a pound per ton and of lime 4 pounds per ton. Actual cost of milling, \$1.10 per ton, on a basis of 120 tons a day.

I have instanced the Dakota mill, not because it presents any new features of the cyanide process, but because it is a fair type of the wet-crushing (with

solution) mills of the surrounding Black Hills district—a process which is eminently successful on the oxidized ores of the Cambrian formation.

This wet-crushing process is somewhat new in the district, and there are yet a number of details to be worked out, e. g., a better extraction, a lessening of costs and a closer saving of values in proportion to the assay value. At the time of writing there are in course of construction some very large wet-crushing cyanide mills whose practice will doubtless eclipse that of the Dakota, and where costs per ton will probably be considerably lower, owing to their larger tonnage and better equipment.

Dry crushing with rolls is also practiced in the district—both fine and coarse crushing. The coarse crushing, about ¼-inch mesh, is only feasible in the siliceous lime of the Carboniferous formation, where, with small equipment of crushing power, a large tonnage can be handled remarkably cheap, and, as the mills are situated at the mines, a very low-grade ore can be handled to a profit.

As regards the fine dry-crushing practice, 12-mesh to 20 mesh, there is not much difference between the practice here and elsewhere. The noticeable points are the almost universal adoption of the 45° angle screen in preference to the revolving or shaking screens. The ores of the district screen very readily, owing to their high siliceous granular nature.

An ingenious device for overcoming dust, as well as helping the treatment, has been adopted by J. O. N. Dorr of Lundberg & Dorr, Deadwood, who mixes the finished product of the rolls as it leaves the bin with a spray of cyanide solution in a mixer, in the center of which is a revolving screw, by means of which the sand is mixed, worked forward to the belt conveyor and transferred to the leaching vats.

Wyoming Topography.

The United States Geological Survey has now ready for distribution engraved maps of the Aladdin quadrangle, Wyoming, the field work for which was completed during the season of 1901. It embraces about 800 square miles of the northeastern corner of Wyoming and includes also a 3-mile strip of the western side of South Dakota. It lies immediately west of the town of Belle Fourche, South Dakota. A 50-foot contour interval was used in drawing the map, and permanent bench marks (at least one in each township) consisting of iron posts with brass caps, upon which the elevation in feet is stamped, have been placed throughout the area.

The Belle Fourche river is the principal stream in this area. This river has its source very near that of the Cheyenne river, and the two streams, starting in opposite directions, eventually encircle the Black Hills region and meet to the east of the hills. Other principal streams in this quadrangle are Hay, Redwater, Oak, Pine and Crow creeks.

The Bear Lodge mountains traverse almost the entire length of the quadrangle and their streams afford water supply for considerable farming along their base.

A fair quality of bituminous coal is mined in the vicinity of Aladdin, although in comparative small quantities. The northern half of the area is devoted to cattle grazing, which is an important industry in that country.

The mapping of this area and of the Devils Tower quadrangle to the northwest (now in course of construction) will complete the mapping of the entire Black Hills uplift.

A topographic map known as the Encampment Special map, embracing about 450 square miles in southern Wyoming, has just been published by the United States Geological Survey. The area mapped is a high mountainous region, ranging from about 6700 to 11,000 feet above sea level, and is crossed near the middle in a north-south direction by the Continental Divide. The map is on a scale of about 1½ mile to the inch. The topography of the region is shown by brown contour lines drawn at vertical intervals of 100 feet, streams and lakes are shown in blue, and houses, villages and roads in black.

The town of Encampment, near the northeast corner, is the center of a rich copper mining district, and its large recently built smelter is supplied with ores from the mines along the Continental Divide, the ores being conveyed from mine to smelter in one instance by an aerial tramway 15 miles long.

The Encampment river is about to be utilized to develop extensive water power near the town.

Tin in the East Indies.

A correspondent of the London Mining Journal, writing from Singapore, says:

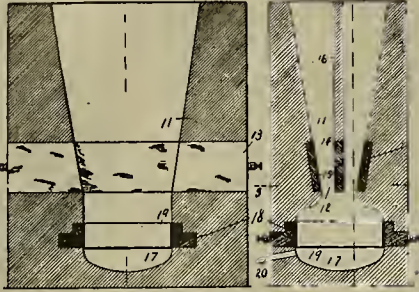
"It may interest you to know that on many of the islands extending from Sinkep, which is only a few hours from Singapore (in fact, I have found a little tin in Singapore itself outside the smelters), through Sumatra, Flores, towards Timor, tin exists, and, in some instances in great quantities. But you know the Dutch Government will not let it be worked. I think it is because of swamping the market, or some equally foolish reason. The companies working in Billiton and Banka have to pay 50% royalty; so you can judge of the quantities that exist when people can be induced to work on those terms."

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 16, 1903.

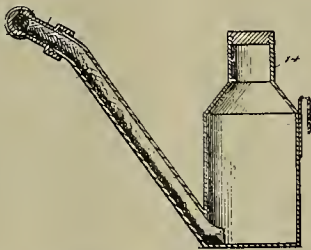
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ART OF MAKING STEEL DIRECT FROM IRON ORE.—No. 730,746; M. R. Conley, Brooklyn, N. Y.



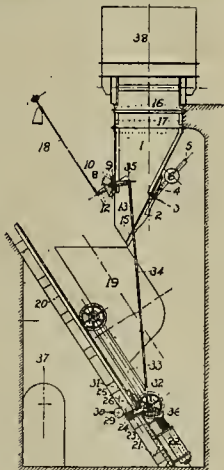
In the art of making steel from iron ore, mingling with ore sufficient carbon to essentially combine with oxygen of ore when heated and pass off as carbonic oxide, and melting mass in essentially closed furnace by feeding through heated belt or zone of higher temperature than obtainable in ordinary blast furnace to retaining hearth.

MINER'S LAMP.—No. 730,907; T. Gossack, Belt, Mont.



Hydrocarbon lamp comprising wick tube and burner head having stem projecting at angle thereto and rotatably engaged with wick tube, said burner head having gas openings one side thereof positioned to lie either at upper side or lower side of burner head, corresponding to position to which head may be rotated.

DEVICE FOR CHARGING BLAST FURNACES.—No. 730,922; M. W. Johnson, Jr., Birmingham, Ala.



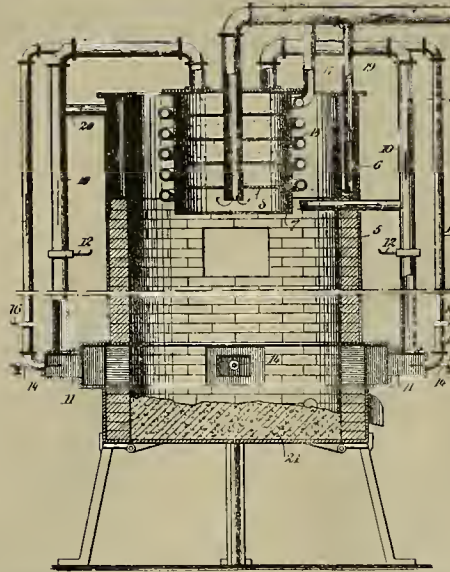
Combination with scale car to carry load from source of supply and skips to elevate load to furnace, of intermediate vessels adapted to divide and receive load from car and independently deliver same to skips.

PROCESS OF OBTAINING ZINC.—No. 731,184; E. H. Hopkins, London, England.



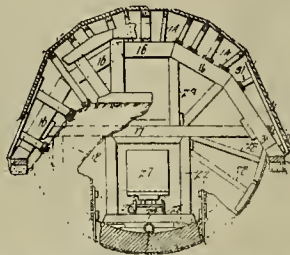
Process of reducing and collecting zinc by subjecting material containing zinc to heat in presence of reducing agent, excluding air and heating flame therefrom, and conveying zinc vapors into and condensing all of them in mass of heated carbon, from which air is excluded.

CUPOLA.—No. 731,300; T. Holland, New York, N. Y.



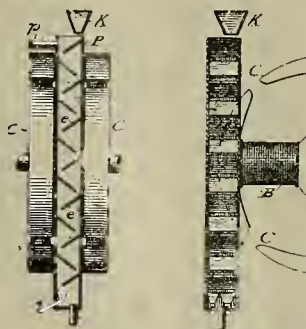
Combination with cupola, of air receiver arranged in upper portion thereof, air supply pipe leading into receiver, cold-air supply pipe having portion coiled around receiver, pipe communicating with lower portion of cupola, and pipes leading from receiver to lower portion of cupola.

METHOD OF TUNNELING.—No. 731,198; J. C. Meem, Brooklyn, N. Y.



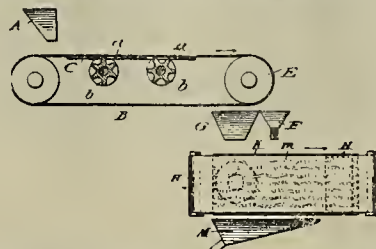
Method of tunneling, which consists in providing temporary roof support, excavating beneath it and moving it forward rapidly as excavation is completed, positioning permanent roof lagging as temporary support is advanced, positioning wall plates, setting arch segments, blocking up roof from them, digging trench full depth of tunnel and placing section of cradle and masonry therein, and setting arch ribs and spring timbers upon invert thus formed.

DIAMAGNETIC SEPARATION.—No. 731,042; E. Gates, Chevy Chase, Md.



Method of separating diamagnetic substances from mixture containing them, in feeding mixture into relatively intense part of magnetic field, rapidly moving field in direction opposed to feeding of material to increase number of lines of force traversed and continuing material in magnetic field until diamagnetic particles shall have moved outwardly to be separately collected as heads.

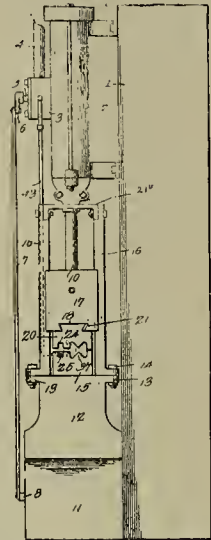
SEPARATING DIAMAGNETIC METAL FROM SANDS.—No. 731,043; E. Gates, Chevy Chase, Md.



In separating free particles of diamagnetic metal (such as gold, copper and the like) from other diamagnetic material (such as sand) with which they are

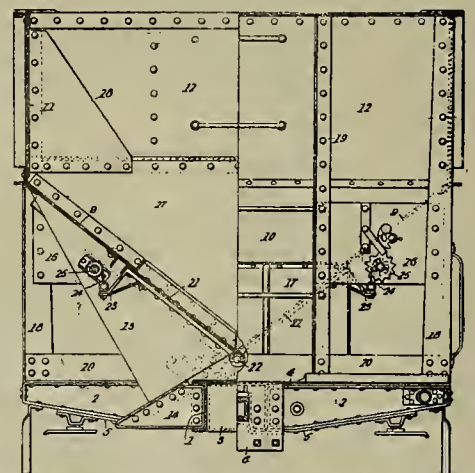
associated, preliminary method of roughly segregating diamagnetic metal from mass, and separating remaining sand from segregated material by admixing particles of magnetic material with mass, enmeshing or entangling diamagnetic metallic particles thereby, concentrating combined metallic particles and diamagnetic particles, and removing remaining sand therefrom by passing concentrate through magnetic field, and diverting mixture of magnetic particles and diamagnetic metallic particles into different paths of collection from that of particles of sand.

DRILL SHARPENING MACHINE.—No. 731,222; J. Retallack, Victor, Colo.



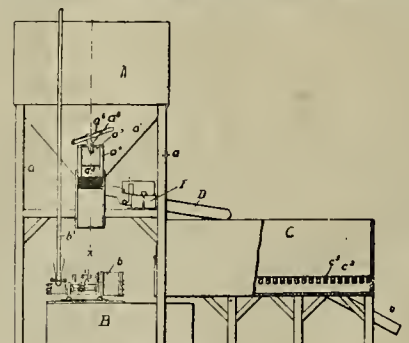
Pair die blocks, one stationary and other movable, blocks being provided in opposing faces with recesses having V-shaped right-angled ribs therein, adjacent walls formed at right angles to walls of ribs, vertical walls at outer edges of recesses having contacting meeting faces forming stops to limit movement of movable die in direction of stationary die.

ORE CAR.—No. 731,242; A. Stucki, Allegheny, Pa.



Ore car having underframe without side sills, and comprising essentially center sills, bolsters, and end platforms having converging sides, body mounted above underframe, provided with outwardly and downwardly opening doors arranged between bolsters.

APPARATUS FOR EXTRACTING METALS FROM ORES.—No. 731,169; C. A. Ellis, El Dorado Canyon, Nev.



Apparatus having hopper provided with inclined bottom, inclined precipitating box connected with hopper outlet, and filtering tank arranged below precipitating box, whereby mixture of pulverized ore and chemical solution may be passed from hopper, through precipitating box into filtering tank, by action of gravity.

Mining Summary.

Specially compiled and reported for the
MINING AND SCIENTIFIC PRESS.

ALASKA.

(Special Correspondence).—There is a report that an extensive paystreak was located on Problem gulch, a tributary to Mystery creek, which is a tributary to Shovel creek. Heavy snow fell last week, and it is presumed that heavy floods will take place in the spring. The thermometer, however, was high during all of last week and it is the opinion of old timers the district will have an early spring. Nome, March 16.

A new placer gold field is reported on Lowe river, 23 miles from Valdez, by E. A. & E. H. Craig and G. C. Wilson. The reports show that there are several hundred acres of gravel from 3 to 30 feet deep, all of which carries values. It is a hydraulic proposition, though in some instances good pay has been made by cradlers. There is plenty of water. The ground located is 3 miles above Wortman's roadhouse, on Lowe river.

The Nome Nugget says the season's developments have shown that at least 6 miles of the Imachuk river, near Candle, carries pay.

On Gold Run creek, near Nome, Sleffert & Gibson have been operating a steam thawer on No. 1 Alder the past winter, and thawers have been used on Gold Run benches by C. F. Rice, A. Dawson, O'Leary & Durand, F. Aldrich and D. Spurgeon and other parties. The benches of Oregon and Hungry creeks have been attracting considerable attention.

Gold is being taken out on Shumak creek, a tributary of Koluk river, near Candle City.

At Mason's discovery claim, in four days' rocking, two hours a day, \$115 was taken out from the river bed in 2 feet of water. This claim is below the canyon. On the gravel bank, 60 feet high, Mason and Van Leer got from one cent to five cents to the pan, says the Nome Nugget. The Lindblom party report having some quartz claims as well as reporting placers. Council reports say work last winter showed gravel beds on the hills of Melsing and Mystery, ranging in depth from 65 feet on the former to 35 feet on the latter, and carrying gold all through. The Neublunk also prospects well.

Manager C. C. Schubert, of the Jualpa M. Co., operating near Juneau, says a 10-ton capacity derrick to be operated by compressed air is being put up at their hydraulic placer mine. The compressor has been set up. The company will have the flume rebuilt.

ARIZONA.

COCHISE COUNTY.

The Bisbee Queen C. Co. will use a diamond drill to prospect their ground near Bisbee, says President B. F. Graham. Meanwhile work continues on the triple compartment shaft.

MARICOPA COUNTY.

The Oro Grande Exploration & D. Co. has bought the Iowa, Texas, Big Six and Brooklyn mines, near Wickenburg, and has let a contract to sink a shaft to water level, says the News-Herald.

MOHAVE COUNTY.

It is reported a body of good ore has been struck in one of the drifts from the 400-foot level of the San Francisco mine, at Cedar Valley. Superintendent Pickering is putting in machinery for the mill and mine, including compressor plant. The mill will be kept running on ore from development work. No stopping will be done for some time.

PIMA COUNTY.

The Arizona G. & C. Co. of New York is building a fifty-ton concentrating plant near the Old Salero camp in Tyndall district, near Tucson, says Superintendent Crow. F. B. Williams is president.

The Banner M. Co. propose building a 100-ton concentrating plant on its ground in the Sierrita mountains, near Tucson. The veins carry copper, lead and silver.

SANTA CRUZ COUNTY.

The Montana mine, near Oro Blanco, will resume under a year's lease by H. W. Squires of Los Angeles, Cal., who is also interested in the McDonald group. The 30-stamp mill at the Old Glory mine is running steadily.

Manager T. F. Kelley of the Arizona Hydraulic M. Co., says they have operations for the summer season under way at their placers near Old Glory.

YAVAPAI COUNTY.

(Special Correspondence).—The Rigby M. & D. Co. are installing a plant of 100 tons daily capacity at Mayer for the treatment of gold, silver and copper ore by the Pöhle-Croasdale volatilization process. In

this process the ground or crushed ore, mixed with the proper proportion of sulphur and sodium chloride, is subjected to an oxidizing roast in an oil-burning reverberatory furnace. The resulting chlorides of the metals are condensed from the fumes in flue chambers and afterwards reduced. It is claimed that the process saves from 95% to 100% of values in gold, silver, copper and lead ores. The company expects to blow in on October 1, 1903. T. J. Rigby is president and manager and H. A. Clark is superintendent.

The Merchants' M. Co. of Yavapai county is shipping one carload of ore per day to the Standard smelter for concentration.

The Azurite group, in Los Prietas mountains, 14 miles southeast of Prescott, is being developed. Hickey & O'Reilly of Prescott are owners.

The 20-stamp mill and cyanide plant of the Golden Link M. Co. at Hillside will commence operations about July 1. Water has been struck and an electric pump installed to raise the water from the Santa Maria river to the mill. An oil pump and tank at Hillside will furnish fuel oil, to be freighted 18 miles to the plant. A large quantity of high-grade ore is clocked out in the mine and on the dumps. Prescott, June 23.

A hoisting plant is to be placed on the Electra mine, the main shaft of which will be sunk to depth of 1000 feet. It is said ore from the claim carries \$15 per ton gold and 10% copper.

The Conger mill, near Jerome, is reported to be in operation again. The ore is obtained from the Etta mine, which has been reopened.

The Oro Fino D. Co., that has taken over the Gold Rock Con. group at Oro Blanco, is refitting the mill building and will put in a cyanide plant, 2 miles south of the McDonald group. The McDonald group of gold mines, in Oro Blanco district, is reported sold to San Francisco men for \$80,000, and first payment of \$25,000 made.

A 50 H. P. boiler is being set up by the Ideal M. Co., operating the Blake group, on Groom creek, near Groomcreek. W. Thessing has put up a whim on his Comet group of eight copper claims in Black canyon, near Prescott, and will sink to water level.

Foreman J. S. Riley of the Gold Link M. Co. group in Santa Maria section, near Prescott, says he expects the 20-stamp mill will be put in operation by July 1st. There is a cyanide plant for treatment of tailings. The ore is wholly free milling and values are said to run \$20 per ton gold. An electric pump has been put in and a pipeline is being laid from the mill to the Santa Maria river, 4000 feet distant. Oil will be used for fuel. The company keeps a large tank full of oil at Hillside station, 18 miles distant, and the wagon tank takes 600 gallons to the mine each trip, says the Courier.

W. H. Bates has bonded the Bullard mines, near Martinez.

The White Horse mine, near Walker, owned by the Monroe Con. M. Co., is reported closed down for an indefinite period.

ARKANSAS.

MARION COUNTY.

The Silver Hollow lead-zinc mine on Buffalo river, near Yellville, has been sold to a Pittsburg, Pa., company for \$75,000. They will erect a concentrating plant and put Silver Hollow on a shipping basis.

A one-half interest in the Ike Emory mine in Warren Creek district for \$5000 has been bought by S. W. Woods, of Yellville. The mill at the White Eagle mine on Buffalo river is in operation. The ore averages 15% mine run and the concentrates assay 60% metallic zinc.

Work on the group of the Philadelphia Zinc Co., near Yellville, is progressing, says J. Douglass, of Cape May, N. J., manager. The company will put in steam drills and, later, a concentrating plant will be built.

The Susquehanna mine near Dodd City district has been leased by R. Sandstrom of Dodd City, who will further develop. He has bought the hoisting plant, and as soon as development work warrants, will put up a concentrator.

SHARP COUNTY.

Work on the concentrating plant being built by the Lisk M. Co. at their Red Fox and King Jack mines, near Smithville, (Lawrence county), is progressing. The plant will be of 100 tons daily capacity.

CALIFORNIA.

AMADOR COUNTY.

At the Kennedy mine, near Jackson, the machinery of the hoist is all in place and the gallows-frame is expected to be finished by July 15th. The mine has 250 men at work.

At the Argonaut mine, near Jackson, a few men are at work fixing the roadway so that material may be hauled to the

mine. The shaft will be repaired preparatory to resuming.

BUTTE COUNTY.

The Gold Bank quartz mine of Forbes-town was shut down last week. It is said to be the intention of the owners to dismantle the plant with which it is equipped. For the past year work has been principally confined to taking out the pillars of ore left behind in former working and to doing prospecting work.

CALAVERAS COUNTY.

It is reported work will be resumed on the Pioneer Chief (the Thorn mine), near San Andreas, next week.

EL DORADO COUNTY.

The Crusader Co. on Mathenas creek, near Placerville, has men at work developing their group, a mile and a half north of the Union mine.

KERN COUNTY.

All the employees of the Yellow Aster M. & M. Co., near Randsburg, numbering over 200, are out on a strike because of a demand by the union for a 50 cents a day increase in wages. The mills have been cleaned up and the mules sent to pasture. The St. Elmo group of the Johannesburg G. M. Co. has shut down and Manager Ericson has gone to New York. The Butte Con. M. Co. men are out, as also those on the Baltic mine. The Santa Ana mine is paying the 50 cents increase asked. C. A. Burcham, part owner of the Yellow Aster mine, says the company will not give in to the demands of the men for higher wages, and that the statement that the Yellow Aster property was or is for sale is in error. The merchants of Randsburg are hesitating before rebuilding the property destroyed by fire.

The Potomac Oil Co., near Bakersfield, is abandoning the use of air compressors in working its wells, and will return to the former method of pumping, says the Oil Reporter.

The Sterling Oil Co. will drill four additional wells on its property at Kern river, near Bakersfield, and is building the rigs. A boiler plant is to be put up. The company is operating a number of wells and is shipping oil.

MADERA COUNTY.

(Special Correspondence).—Preparations are being made to screen and work the dumps of the Gambetta mine at Grub gulch. The workings are down 850 feet. The vein is small, but carries high values in gold, and it is thought a great deal of gold can be recovered from the discarded waste.

An easterly extension of the Josephine vein has been opened up by C. M. Ward & Co., of Grub Gulch, and some good ore is being found. The Josephine was worked to a depth of 600 feet.

A new shaft is being sunk on the Crystal Spring mine at Grub Gulch, and \$150 ore is being found. The vein is small, as yet, however. Some ore has been crushed at the Gambetta mill.

The Savannah mine, south of Fresno river, 2½ miles south of Grub Gulch, is in operation. Development work is in progress.

The mines of this district are chiefly in mica schist and mica slate. The ores are free milling and there is little water in the mines.

Grub Gulch, June 23.

NEVADA COUNTY.

Buck Bros. resumed operations at their German Bar mine at Moore's Flat last week. The ore is free milling. There are three tunnels on the mine.

Near Maybert, the Eastman and Sienop gravel mines are reported bought by G. F. Fowler of Holyoke, Mass.

The 10-stamp mill at the Oustomah mine, near Grass Valley, is in operation, says Superintendent F. S. Morgan.

PLACER COUNTY.

The Hidden Treasure Gravel M. Co., near Centerville, has put in a 15-kilowatt direct connected electric generator for lighting purposes.

PLUMAS COUNTY.

T. Dunn, of Greenville, has bought the Round Valley Con. group of mines, in North canyon, near Greenville. The consolidation consists of five claims. The sale also includes a 10-stamp quartz mill. The tunnel to cut at depth the vein which crops on the surface of the Antelope claim will have to be driven 500 feet farther. In driving this tunnel, the vein, 48 feet wide, in the Phoenix claim of the Johnny Bull group adjoining, was cut. Dunn proposes to build a 40-ton cyanide plant.

F. A. Meidinger, of the Five Bear M. Co., has bought the Centennial mine, mill and water right in Genesee valley, near Genesee, says the Quincy Bulletin. The Five Bear Co. own 4500 feet on the Genesee belt and the Centennial tunnel and mill facilities. The mill will be equipped with a crusher and cyanide plant to treat the tailings after amalgamation. The lower tunnel of the Centennial mine will be driven on the vein for 1000 feet, and an

air compressor and drills for this work will be put in. The Five Bear Co. has located and appropriated the waters of the middle fork of Ford creek at an elevation of 900 feet above the Centennial mill.

SANTA BARBARA COUNTY.

The Mount Solomon Oil Co. was incorporated at San Francisco last week by P. and A. Tognazzini, H. Brunner, S. A. Dana, D. D. Barnard and F. Kronenberg, Jr. They will operate in the L. M. Kaiser land, east of the Pinal Oil Co.'s land, near Santa Barbara. The Kaiser asphaltum mines are on this land.

SIERRA COUNTY.

At Fir Cap, near Nevada City, J. W. Finney, superintendent of the Telegraph mine, has fifteen men at work grading for a mill and repairing the road leading from Downieville so as to bring in a 5-stamp mill, boiler and engine. The mine adjoins the White Bear on the north. J. Collins and M. Flynn, owning adjoining ground in the same locality, are making preparations to do development work and intend running a 1000-foot tunnel to tap the main channel.

TUOLUMNE COUNTY.

Operations in the Denmore mine, on the Stanislaus river, near Columbia, are confined to development work, and only a few men are employed. The mill closed last week, says the Sonora Democrat.

G. B. Lynn has bonded the Sunset quartz mine on Knights creek, near the Dorsey and Newcomer mill, near Columbia.

J. N. and E. W. S. Woods, of Stockton, have bought a half-interest in the Mountain Belle quartz claim, also the Parallel quartz claim, near Soulsbyville. At the Phillips mine, operated by J. Phillips, near the Telegraph Line mine, grading is in progress for a 10-stamp mill.

At the Mohican mine near Groveland, Superintendent F. Chappellat has teams hauling lumber for the improvements at the mine, which consist of an addition to the mill and a new hoist.

There are thirty men at work at the Doyle Ranch gravel mine, near Columbia, where a 125-foot shaft is down and drifting going on. The shaft will be deepened to the bottom of the channel.

The Black Oak G. M. Co. are reported putting in additional machinery at their mine near Soulsbyville.

COLORADO.

BOULDER COUNTY.

A gasoline hoist has been put on in the tunnel of the New National Tunnel M. Co., east of Black Hawk, and increased operations begun. Chicago parties are interested.

The Boulder Illuminating Oil Co. of Colorado Springs propose sinking another hole alongside the former well at Boulder, which was practically ruined several months ago in an attempt to shoot it, says the Telegraph. The well was sunk to depth of 3000 feet and yielded 250 feet of oil.

At Magnolia the Cumberland tunnel is in 1120 feet and shipping five tons of ore per day, says Superintendent Davis, part owner. Work on the India shaft has been suspended until the Cumberland is driven in under the India, when an upraise will be made to connect both workings. This company will take over the Kekionga mine, when air drills will be used.

CHAFFEE COUNTY.

H. S. Smith of Cripple Creek, who has been working the Futurity copper mine, east of Calumet and 40 miles west of Cripple Creek, says ore is being opened up in a drift being run at depth of 300 feet. Assays show 20% copper and \$4 gold.

The Pacific G. M. & M. Co., owning and operating the Gopher and other mines near Granite, has let a contract for sinking the main shaft 200 feet deeper, a total of 310 feet, and from this depth levels will be run off at 200 and 300 feet, opening the ore shoot at these depths, says the Telegraph. In the first level at depth of 110 feet 14 inches of ore running \$88 a ton have been opened. The company has a plant on the ground which, however, will be replaced by one of double the capacity. The hoist will have a lifting capacity from 1000 feet. The Gopher, on which these improvements are to be made, adjoins the Yankee Blade mine on Yankee Blade hill, and the Gillespie claim adjoins the Washington. W. A. Swain of Pittsburg, Pa., is president.

The Salida G. & C. M. Co., E. B. Green president and mill manager, are putting in pulverizing machinery for the copper leaching plant building north of the Salida smelter and near the Sedalia copper mine, which the company controls and will operate.

The Standard M. & M. Co. has been organized by H. R. Chapman and J. C. Schneider of Colorado Springs and H. R. Penfield of Manitou, with W. L. Howe and G. H. Schneider of Chicago, Ill., to operate the Sunrise and Jasper groups at

Granite. They report opening in the main workings a body of gold ore, with hematite, assaying \$10. A new shaft is being sunk which will be continued to 100 feet. On the Sunrise claim the 65-foot shaft has opened a 5-foot vein.

CLEAR CREEK COUNTY.

Manager Reed of the Bonieta mill, near Idaho Springs, has begun work on the addition to the mill for cyaniding the slimes.

A gasoline engine has been put in place on the Wide Mountain group of mines on Leavenworth mountain, near Georgetown, furnishing air and hoisting.

CUSTER COUNTY.

The property of the Melrose M. Co. at Querida has closed down, only the engineers and pumpmen being retained. No cause for the closure is given, says the Post.

A matte smelter is proposed by the Little Bernice G. M. Co., near Custer. A body of ore has been struck, and the intention is to have the ore treated at or near the mine.—At the Golden Cycle mine, J. W. Preston, owner, reports ore being opened up.

The Custer M. & R. Co. has been reorganized and is developing its mines in and about Custer. Work is being done on the first Colorado lode, where at depth of 25 feet gold ore is showing.

Development work at the Keystone M. Co.'s group at Spring Hill has begun. The gasoline engine and hoist have been set up and the gallows-frame completed. The company will also build an assay office.

DOLORES COUNTY.

It is reported N. L. Baumgardner, manager of the Rico Con. M. Co., will begin work on the company's mines near Rico by July 1.

FREMONT COUNTY.

Manager D. C. Jackling of the United States R. & R. Co., operating at Florence and at Canyon City, says the \$150,000 improvements to the United States Zinc smelter at Canyon City will be put in full operation July 1st. Since March 1st the smelter has been hampered by reason of the fire, which burned two bag houses, machine shops, refinery, storehouse and several other buildings. Meanwhile, they have rebuilt the smelter and doubled the capacity. After July 1st, 5000 tons of ore a month can be handled. The product of the smelter in paint pigment will be 750 tons a month. They will have 125 men at work. In making white lead, the gold, silver and copper values are also saved from the ore. At this smelter the ores are burned, the zinc and lead passing off in fumes, which are carried into the bag houses. Here there are hurlap bags 1 foot in diameter and 40 feet high suspended from the roof, into which the fumes pass, driven by compressed air. The smoke is passed through the hurlap, escaping into the chimneys, while the zinc and lead are collected in the meshes of the bags in the form of a fine white powder, which is afterwards shaken down and received into hoppers directly underneath the bags. The product is then taken to the refinery, where it is again subjected to heat and purified. The gold, silver and lead values are recovered by the usual methods of fluxing.

The coal mine at Williamshurg, flooded by rains, was unwatered and operations resumed last week.

GILPIN COUNTY.

R. Hughes of Russell Gulch, with Denver parties, have taken a lease and bond on the Becky Sharp mine in Russell district. They intend putting in hoisting machinery and also suitable top buildings. The main shaft is down 150 feet and will be retimbered and put in shape for sinking.

W. L. Shull of Russell Gulch, with Denver men, has a lease and bond on the Paola mine (to be known as the Phillips mine) in Leavenworth gulch. A frame is being built and it is the intention of the lessees to put in machinery this summer. The main shaft is 200 feet deep and will be cleaned out and retimbered, as also the levels, and development resumed. Ores running 15% copper have been taken out.

The Stanley & Irish mill in Lump gulch, near Rollinsville, has been started up by the Cadillac M. & M. Co., and is running steadily on ores from the Myres and Friend mines owned by the company.

Sinking operations are being carried on with three shifts at the North Star shaft of the Ann Rutledge G. M. Co., in Vermilion district, near Central City. The shaft is down 230 feet, reports Superintendent McMillen.

GUNNISON COUNTY.

The Augusta compressor, near Crested Butte, is running steadily and the tunnel is going ahead. It is in 2400 feet, and nearing the shoot of ore opened in the upper workings. Work on the ore shoot opened last season in the old tunnel has been resumed and ore shipments started. More jacks have been added to the pack

train and packing ore to Anthracite switch is under way. The vein is 4 feet wide and carries 2 feet of high-grade ore with gold and lead values.

The Hercules and Ajax properties in Elko district, near Crested Butte, are resuming. Considerable development work has been done and a 4-foot vein is showing which runs \$160 in gold, twenty-five ounces in silver and 4% in copper.

In Gothic district, near Crested Butte, the Rustler, Copper Creek, Bellview, Gothic and other companies composed of Illinois men principally will operate their holdings. F. L. Clemons, of Canton, Ill., says his company proposes to build a concentrating plant and matte smelter.

LAKE COUNTY.

At the Janson, Neptune and Whale claims in Poverty Flats, near Leadville, owned by Carleton Bros., operations will be begun next week.

E. E. Miner, manager of the Manhattan M. & M. Co., operating at Twin Lakes, is preparing plans for a concentrating mill.

B. C. Reed of Denver, president of the Last Chance M. & M. Co., operating at Twin Lakes, is arranging to build a 100-ton mill, says the Leadville News-Dispatch.

The top works at the Fortune mine, near Leadville, which were destroyed by fire last week, will be rebuilt.

The New Monarch M. Co., says Manager Goodwin, will sink the New Monarch shaft at Leadville 2000 feet. Diamond drill explorations have shown the existence of sulphide below the present 700-foot level of the mine. The shaft will be retimbered from top to bottom and a plant, including five 200 H. P. boilers, will be put up. In the meantime there will be no cessation of productive activity. In the next ten days the Winnie and New Monarch will be outputting 300 tons daily—principally from the first named—some of which will be sent to the Republic plant.

Two compound pumps have been set up at the 660-foot level of the Coronado mine at Leadville. Both pumps have a capacity of 800 gallons, and will be used as a base of operations when the sinking of the shaft begins. It is intended to complete the Midas drift, which has 130 feet yet to go, which will strike a point below the bottom of the Midas shaft, and an upraise will be driven to connect with it.

Manager A. Boyd of the Fanchon mine, near Leadville, expects to resume operations on the company's shaft next week, which will be sunk 200 feet. The company has two of its shafts under lease and steady shipments of ore are maintained.

The Arkansas Valley smelter, near Leadville, is receiving 1300 tons of ore daily. Twenty-three roasters are in operation.

J. C. Ryan has started work on the Madison-Ryan group of claims in Dutch gulch, near Leadville.

MINERAL COUNTY.

Manager J. Nause of the Nelson Mountain M. Co. says operations are resumed at their mines near Creede.

The Chance and Del Monte mines, near Creede, are making shipments of ore and more men have been put at work.

OURAY COUNTY.

C. F. Fishback of Wyoming, with Chicago men, has bought the Torpedo-Eclipse group of mines on Mt. Sneffels, near Sneffels, near the Revenue, the Virginus and the Camp Bird mines and mill. The ore is free milling. Operations will be started July 1st.

Superintendent W. H. Roernaes is preparing to resume on the American mine, 2 miles east of Ironton, up Corkscrew gulch, and expects to begin ore shipments by August 15.

At the San Pedro mine, near Ouray, Superintendent Pierson has men at work and will build 2 miles of wagon road to bring in a compressor, power drills and other machinery. The crosscut tunnel is in 850 feet and driving at the rate of 4½ feet per day.

Superintendent J. S. Reid says operations have resumed at the Bonanza mine, near Ouray, and he will drive with power drills a 1000-foot crosscut tunnel to tap the known ore bodies at depth.

PITKIN COUNTY.

J. F. Willard of Colorado City, manager of the Red Mountain M. & D. Co., reports selling the four Ruby claims of their group to Eastern men for \$30,000. Their mines are in Lincoln gulch, Red Mountain district. There are six claims left, on which the company will increase development work. The State has appropriated \$5000 to build a road from Aspen to Red mountain, which will open the camp. The distance is 20 miles, of which 10 miles have been built by private capital.

SAGUACHE COUNTY.

Manager R. Willis of Colorado Springs says the Mountain Lion M., M. & P. Co. has been organized at Philadelphia, Pa., to develop a group near Villa Grove.

There are three shafts which show streaks of galena ore. The main shaft is down 150 feet. There is a water right which will afford power the year around.

SAN JUAN COUNTY.

C. W. Barry, superintendent of the Big Five M. Co., at Howardsville, reports the Union tunnel is in 900 feet and a contract for an additional 100 feet has been let. The tunnel started into Galena Mt. is in 120 feet.

SAN MIGUEL COUNTY.

L. White reports the Blue Lake vein as being 10 feet wide in the breast and of milling ore. The drift, which is being driven on the ore, is in 270 feet, having out, in its course, the vein of the Fly lode, one of the group crossing the Blue Lake lode. The vein where cut shows 2 feet of ore, with values in silver and gold.

TELLER COUNTY.

The Sioux Falls G. M. Co., which is operating the Fluorine mine, near Cripple Creek, under a five years' lease, is building a 100-ton cyanide plant. It is claimed by Manager Blanchard there is a 75-foot dike of ore that runs \$6 a ton and that this ore can be mined, crushed and treated for a cost not to exceed \$3 a ton.

T. Heslop of Victor is building an experimental cyanide plant on the south side of Straub mountain, 2 miles south of Victor, for Chicago men. If the tests prove satisfactory the mill will be enlarged to capacity of 150 tons daily. It is claimed the company has sixty acres of ground which contain deposits of gravel that averages in value \$2.50 per ton in gold.

Manager S. S. Bernard of the El Paso Con. G. M. Co. at Cripple Creek, says they will sink their three-compartment shaft to 1000 feet, adding 400 feet to the present depth, and will cut stations at 700, 800, 900 and 1000 feet, running out crosscuts from the seventh and eighth levels and opening the vein as soon as the drainage tunnel begins to make appreciable decrease on the water of the Cripple Creek basin. They plan to open the ore shoot found in the main vein in the 600-foot level south of the shaft. The vein is dipping to the west and the ore shoot pitching north, so that at 800 feet it is expected to be directly in the shaft.

Gilbert et al., who own a lease on a block of the Sheriff ground at Windy Point, Cripple Creek, resumed last week. Returns for the last shipment sent out gave them values of \$20 per ton. S. N. Simmonds, lessee, who has been operating on the Zenobia, has also begun working on a lease on the south end of the Sheriff. His lease covers a block which adjoins the Twin Sisters.

Plans have been drawn for a 100-ton addition to the roasters of the Portland mill, at Victor, and work begun, says President J. F. Burns, at Colorado Springs. The addition will give the Portland mill a roasting capacity of 350 tons a day. The new furnace will be a circular one in which the ore is carried about by means of a revolving hearth and is roasted by gas generated in the center. The rabbies are stationary and work the ore in a spiral movement. Oil is used for fuel.

The Merrimac Con. M. Co., at Cripple Creek, have leased their ground to Eastern parties for two years and given rights to use the company's workings. There is a shaft 75 feet deep which will be sunk to 250 feet, from which levels will be run out to cut the C. K. & N. vein, which is thought to extend into that property. Machinery will be put in at the Merrimac and development work increased. A second lease will be granted on another block of ground, adding a plant of machinery to that end of the property. The company owns Woodman and Columbia claims on Beacon hill. E. E. Armour of Denver is president.

Development on the Thompson mine of the Elkton Co. at Cripple Creek, says Lessee Wright, who is operating on the ground, has opened up ore, which is being broken from three distinct shoots, and the entire product averages \$20 per ton. The ore in the Apple Ellen shoot has been opened in the 500-foot level and a drive is being made to this body in the third and fourth levels. This shoot averages 3½ feet in width. The Thompson shoot in the Elkton vein is being broken 20 feet in width, which returns values of \$13 per ton. The Thompson shoot in the Walter vein is averaging 3½ feet in width of \$20 rock.

The Chicago Leasing Co., which has a three years' lease on the Hoosier mine, on Tenderfoot hill, near Cripple Creek, has decided to deepen the main shaft, down 487 feet, by 200 feet. Levels will be run at 587 and 687 feet on the vein. J. K. Walsh is manager.

GEORGIA.

DUFFY COUNTY.

The Georgia-Montana G. M. Co., composed of J. F. Cowan, G. H. Casey, C.

Hand and others, has taken a 10-year lease and bond upon a gold property, 37 miles northwest of Augusta. The claim is near the Columbia mine which has produced considerable gold. The mine has not been worked since 1860. It was nearly full of water and partly caved in when the Montana men took hold of it. It is a fissure vein in mica schist. The shaft is down 150 feet. On the 100-foot level the ore shoot is 300 feet long and the vein at the face of the level is 17 feet wide. The ore averages \$10, and is free milling. At the 150-foot level ore running \$30 per ton in gold has been taken out. Wages are 75 cents to \$1 per day for common laborers, mostly negroes. It is the intention to put up a stamp mill. The mine makes fifty gallons of water per minute.

IDAHO.

BLAINE COUNTY.

A. Ford, superintendent of the Ohio Co., operating placer claims on the South Boise river, near Hailey, has begun operations. He has a hydraulic giant and 1000 feet of 11-inch pipe.

At the Tyrannis mine, in Little Smoky district, near Hailey, what ore has been extracted to date will be put through the concentrator and shipped, after which operations will be suspended until fall.

CUSTER COUNTY.

Mackay reports tell of a gold strike on Beaver creek, 40 miles above Mackay. The vein is 3 feet thick and runs \$60 per ton.

ELMORE COUNTY.

Near Mountain Home, the Elmore group of mines has been sold to G. McCargo of Pittsburgh, Pa., and I. E. Rockwell of Chicago, Ill., for 20,000. The group consists of seven patented claims at Rocky Bar. It is equipped with hoisting works and a 50-stamp mill. M. F. Leech is superintendent and has started development work.

C. D. Morgan of Boise says mining operations around Atlanta and Rocky Bar are increasing. At the Pettit mine eighteen men are at work, and at the Big Lode Superintendent S. Oglesby is opening up the mine. W. S. Brown is working men on the Minerva group and expects to use twenty miners all summer.

IDAHO COUNTY.

C. H. Fish has bonded a group of sixteen claims in the Marshall Lake district, near Grangeville. Veins have been opened which assay from \$18 upward. Mr. Fish also holds contracts on some other property in the district. If values are maintained at depth, he will put in a plant for reducing the ore.

E. B. Stewart has a bond on claims near the Jewel, near Grangeville. Considerable development work has been done. The ore is high grade.

In El Dorado mining district, near Collins Hot Springs, near Stites, the F. Stickmer group of claims has been bonded to L. D. Lively & Co. of Lewiston for \$6000. Work is under way.

S. McKibben of Elk City, superintendent of the mines owned by the Thunder Mountain G. Co., says they will put in a 5-stamp mill at the mine, which is 60 miles east of Stites and 10 miles east of the American Eagle mine.

OWYHEE COUNTY.

Work is under way on the Imperial and Lucky Gus claims, owned by the Imperial M. & M. Co., of which A. Munzing of Akron, Colo., is president. Superintendent T. Fry has men at work sinking the shaft.

SHOSHONE COUNTY.

The Sunflower M. Co. has incorporated at Huron, S. D.; G. M. Adams, Jr., J. D. Meldinger, P. Lawrence, W. Dohl, S. S. Johnson, W. J. Harris and M. Hoke. The company is engaged in placer mining and has a number of claims near Pierce City.

The Simmons property in Bear gulch, 8 miles from Murray, has been bonded to Toledo, Ohio, people for \$250,000. At the depth of 265 feet there is said to be 23 feet of concentrating ore which carries silver and lead. The property is 5 miles from the Hercules. There are nine claims in the group. The new company will build a wagon road to the mine 2 miles long.

MICHIGAN.

HOUGHTON COUNTY.

The management of the Osceola mine, near Calumet, is said to be preparing to sell its Tamarack, Jr., shafts to the Calumet & Hecla. The territory is thoroughly worked out, but the shafts would be valuable to the Calumet & Hecla at a part of its mine where drifts 3000 feet long have no ventilation other than air coming from drills.

The management of the Copper Range railroad is building its tracks up the Atlantic sands, near Houghton, to the mouth of Cole's creek, the site of the new Copper Range smelter. Superintendent F. I. Cairns has begun preliminary work on the

smelter. There will be five reverberatory furnaces, three melting furnaces, 18x50 feet, and two casting furnaces, 15x32 feet. Everything will be automatic. The mineral will be dried by waste gases. Going into the top of the furnaces the metal will be drawn off at the bottom without dipping. There will be one cupola for reducing slags from the furnaces. The smelter will be worked on a combination of Western and lake methods. There will be a special refining process to get rid of arsenic or other deleterious substances in the metal, says the News.

The Michigan Smelter Co. has been incorporated at Houghton by L. L. Hubbard, F. W. Denton, J. H. Rice, A. F. Rees, R. T. McKeever. The principal office of the company will be in Boston, Mass., and the Michigan office at Houghton.

Improvements being made at the Quincy mine, at Hancock, will be finished in the fall, after which it is expected that Nos. 2, 6 and 7 shafts will each furnish a daily rock output of 1100 tons. This would insure monthly rock shipments of 95,000 tons. Rock shipments for May aggregated 74,000 tons and the product of refined copper was \$30 tons. The skips of five and one-half tons capacity each are being replaced by ones of improved design of seven and one-half tons capacity. The large skips have been in use at Nos. 6 and 7 shafts for several months. The underground system of electric haulage north of No. 6 shaft is giving satisfaction.

ONTONAGON COUNTY.

C. H. Taylor, consulting engineer of the Victoria mine at Victoria, says the mine will be worked by compressed air, the air compression being made by means of falling water. It is calculated that the plant will maintain a pressure of 140 pounds of air to the square inch. The Victoria's water power canal is being cut hydraulically by opening the dam and sweeping the material out through the water gates. The tram road from the mine to the mill site is being cut a distance of 4200 feet. The grade runs from 6% to 12% and the cars will be operated by cable. The shaft has reached the nineteenth level. All even levels are being driven to the south to the site of the new shaft 1100 feet from the present one. When these levels are through that shaft will be cut by an up-raise.

MISSOURI.

MONITEAU COUNTY.

In the lead and zinc district around Fortuna there are twenty shafts going down and additional hoisting and pumping machinery has been put in, says the Lead and Zinc News. Several mills are being built. The Youngstown L. & Z. Co., after sinking four holes, are preparing to sink their shaft. The Woodyard shaft is down 135 feet and will sink to 150 feet, at which point their drill records showed ore. Shaft No. 2 on the Wolf tract is down 90 feet and a drift will be run out from their No. 1 shaft. A steam hoist has been set up on the Rochester and sinking resumed. The Horseshoe shaft is now down as far as it can be driven without heavier pumps.—At the Bluff Springs mine underground work is again under way. The mill is also in operation. This company's second shaft is down 50 feet. A peculiarity of this is said to be the fact that a deposit of coal is being worked, furnishing more coal than is required to operate the power plant, and with the coal zinc ore is being mined. Occasional pockets of lead are found.

Work on the King Jack mine, near California, is progressing, the mine being opened up preparatory to building a mill.

MONTANA.

BEAVERHEAD COUNTY.

T. Stevens, of the Indian Queen mine, in Birch Creek district near Dillon, says the smelter was blown in last week. The Indian Queen mine is 12 miles from Apex, the nearest railroad point, and all the coke and supplies used at the smelter will have to be hauled in. High-grade glance is obtained in the mine.

D. Wadams, owner of the Saginaw group of mines in Big Hole basin, near Dillon, on which a shaft to 300 feet has been sunk, says development work will be increased this summer. The Saginaw has 15% copper in sight and a considerable tonnage of low grade ore on the dump, but the long haul to the railroad is expensive. A matting furnace may be built at the mine in the fall.—The reports of a railroad line in the Horse Prairie section have increased prospecting and other work in the mines of the Bloody Dick district.—Only one dredger plant is working in the county this season, that of the Horse Prairie Co., near the Brenner ranch on the head of Horse Prairie, near Dillon.

CHOTEAU COUNTY.

W. Meadowcroft reports drilling operations for oil under way on Swift Current

river, north of Havre. Within 13 miles of the company's ground and across the Canadian line are several producing wells.

DEERLODGE COUNTY.

During the month of May at the Amalgamated C. Co.'s Washoe smelter at Anaconda the output was far in excess of any previous month, says Superintendent Mathewson. The big plant turned out 13,570,000 pounds of copper bullion. The company has its own refinery for this product. There are 2000 men employed at the works in all branches of both mill and smelter, while 200 more men are at work on the flue and chimney being built. The ores from the company's mines contain values in gold and silver and twice each month a quantity of gold and silver bullion is shipped.

LEWIS AND CLARKE COUNTY.

E. C. Braden of Helena, Western representative of the American S. & R. Co., and manager of the East Helena and Great Falls smelters of that company, says they have blown in a new stack at the East Helena smelter and now have three running. The Great Falls smelter is idle. There is not enough ore for both to operate, and they run the least expensive plant.

MADISON COUNTY.

Last week operations were begun on the Elkhorn-Iola mine by A. C. Sandes of Minneapolis, Minn., who has a lease and bond on the group. A 12 H. P. gasoline hoisting engine has been placed on the Elkhorn shaft. This shaft is down 60 feet, with a short drift from the bottom and one at the 40-foot level.

The Little Kid mine, 17 miles from Norris, has been bonded to J. P. Ormond, J. Hore, H. Bush of Jardine and E. A. Dawes of Livingston for three years. A 10-stamp mill, a 20-ton Bryan mill, saw-mill and quarters for the employees go with the bond. The bonders propose building a 100-ton concentrator.

PARK COUNTY.

The Kimberley-Montana Co., at Jardine, expect to have the cyanide plant and new mill complete by July 1, when work will start in the mines.

The St. Julian G. M. Co., near Livingston, has elected W. A. Bercy, president; J. F. Nolan, first vice; A. F. Peck, second vice; P. J. Nolan, secretary and treasurer. The company will erect a 10-stamp mill on their property at Emigrant this summer.

SILVER BOW COUNTY.

Preparations are being made by W. A. Clark to install at his Original mine in Butte an air compressor plant built on the two unit plan. This plant will be large enough to supply all his other mines around Butte, which will be connected by pipelines.

The foundations for the Garretson smelter of the Pittsburg-Montana C. M. Co. at Butte are being put in place. Some machinery for the plant is on the ground. It is expected the works will employ 700 men.

The Emma mine, near Butte, which has been closed for several weeks, is being reopened and a smelting plant will be built.—The Travonia mine, owned by W. A. Clark, has been abandoned, the ore having given out.

The Roins Copper Co. of Butte and Pittsburg, Pa., men, formed to work the Combination mining claim in Meaderville, have begun sinking the shaft an additional 500 feet. This will give a total depth of 1000 feet. Heavy hoisting machinery has been put in. G. W. Stapleton of Butte is vice-president.

NEVADA.

ELKO COUNTY.

The Dexter mine at Tuscarora last week shipped its first bar of gold bullion under the new management, being the output of forty stamps dropping on an average of 100 tons of ore daily, says Manager E. O. Lee at Salt Lake City, Utah. The water struck in the mine is receding rapidly, says Superintendent Taylor. It is proposed to add a slimes plant to their equipment similar to the one at the Con. Mercur Co. at Mercur, Utah. The plant will have a capacity to treat 100 tons of slimes tailings daily to start with and later be increased to 200 tons daily.

ESMERALDA COUNTY.

The Oro Blanco M. Co. has been organized to work four claims adjoining the Montgomery Bros. group in Lida district, 22 miles southeast of Silver Peak. C. H. Elliott, A. F. White, H. H. Brown and T. J. Fitzsimmons are incorporators.

M. H. Seely has bought five claims 10 miles south of Silver Peak and 6 miles from Oasis.

LINCOLN COUNTY.

L. H. Outzen of Richfield, Utah, president of the Annie Laurie Extension M. Co., with L. Neilsen, has a bond on a group of five copper claims 40 miles down Meadow Valley gulch, from Calientes for

\$25,000, running eighteen months. There has been a smelter on the ground and the ledge opened up for 6000 feet. Between the lime and porphyry walls the vein is 50 feet wide and in the center is a 2 foot pay streak. Assays show values in silver and copper. On August 3 Outzen will start work, sinking on the vein. The Clark road will pass 7 miles from the mine.

The E. & F. M. Co. at Jack Rabbit, near Calientes, on the San Pedro route, report two ore strikes in Badger ground, one at depth of 60 feet, where 4 feet of lead ore has been opened; the other 1000 feet distant, where 7 feet of ore is shown. An average of the ore shows twenty-two ounces silver, 20% lead and 80 cents gold per ton. High-grade copper ore from the main workings is being shipped.

At Newberry mountain, 18 miles south of Searchlight and near the California line, the Badger group of mines and the Wisconsin group are being operated under bond by S. F. Dexter of Pawtucket, R. I. The Juniper group is also being worked by Rhode Island parties.

The New Era M. Co., near Searchlight, have begun work on their mill, which will consist of two 5-stamp batteries. A supply of water can be obtained from the Boland well, 1500 feet away, which the company owns.

The Manhattan M. Co., near Pioche, E. F. Freudenthal of Salt Lake City, Utah, manager, report high-grade copper ore opened up in the tunnel on their Stampede group, 8 miles southwest of Pioche. The ore also carries values in gold and silver. A gasoline hoist will be placed in the tunnel and sinking begun on the vein.

NYE COUNTY.

The General Thomas claim at Lone Mountain, and six adjoining claims, have been bought by J. C. Gladden and associates of Salt Lake. The General Thomas claim has 280 feet of work upon it. The ore is lead carbonate, running about 60% lead and from \$30 to \$40 in silver. The dumps contain about 500 tons.

STOREY COUNTY.

The Best & Belcher Co. has leased its mill, near Virginia City, to the Butters Cyanide Co. for crushing rock from the Hale & Norcross dump, the pulp from which will be flumed to the Butters plant in the canyon. The Best & Belcher Co. reserves the right to crush ore in the mill from the mine whenever it may be required for that purpose, says the Enterprise.

WASHOE COUNTY.

The Springfield-Nevada M. Co., in Olinghouse canyon, near Wadsworth, I. Miller, manager, are putting in two 54-foot Huntington and a 30 H. P. gas engine. This is expected to increase their milling capacity by fifty tons per day. The equipment will be moved to mill No. 2, thus doubling its capacity for the treatment of ore from their Slip and Renegade mines.

WHITE PINE COUNTY.

C. B. Frost, manager of the Wild West group of mines at Cherry Creek, says lumber and machinery for their stamp mill is on the ground, and he expects to have it in operation by August 15. In the meantime ore is piling up on the dump.

NEW MEXICO.

LINCOLN COUNTY.

A carload of machinery for the Eagle M. & Imperial Co. of Parsons has arrived at Capitan. The plant consists of crusher and concentrator. Additions to the plant are anticipated.

The Old Abe at White Oaks is installing new machinery. The Montezuma Co. was recently incorporated to develop mines in the White Oaks region.

TAOS COUNTY.

It is stated the Keystone M. Co. will build a smelter to treat the ores for its nineteen claims in Bromide district, 12 miles from Tres Piedras. The ore carries values in gold, copper and silver. J. P. Rinker is superintendent.

At Twining, the Frazer Mountain C. Co.'s smelter is in operation, says Superintendent O. W. Alexander, and making an output of 10,000 pounds of copper daily. The concentrating mill is running steadily. The company has thirty men at work. The mines, smelter and mill are connected by inclined plane and by a wagon road up the canyon. The plant includes concentrator, mill, smelter, charcoal furnaces and lime kiln. Work is progressing in the mine in three places. There is a tunnel in 600 feet and the vein is 20 feet wide. The ore carries some gold and silver, also.

VALENCIA COUNTY.

At the United States land office in Santa Fe, W. N. Houser of Denver, Colo., for the Phelps, Dodge Co., filed eleven coal declaratory statements for 320 acres each in southwestern part of Valencia county, 15 miles east of the Arizona line, says the Albuquerque Journal. This district is 50

miles north of the Dittl range in Socorro county, also north of the Mogollon range and northeast of the headwaters of the Gila river.

OREGON.

BAKER COUNTY.

W. H. Potter has been employed by the Virtue Con. M. Co. to remove the hoisting and milling plant of the Cumberland mine, Silver City, Idaho, to the Virtue mine, 8 miles east of Baker City. The Virtue Co. owns both properties. The Virtue is equipped with an old hoist and 20-stamp mill.

Work on the Oro Fino of the Cove district is to be commenced by J. C. Clark, owner.

The incorporators of the Victor M. Co. are A. Geiser, H. T. Hendryx and E. Parker. It will be known as the Cracker Creek G. M. Co. The president of the company will be C. A. Blesser of Philadelphia, the main office of the company being in that city, and a branch office at Spokane, Wash., wherein A. G. Hanauer will hold the office of secretary and treasurer. A compressor plant and large gasoline engine is to be installed.

The management of the Golden Wizard mine, near Sumpter, propose building a 100-ton concentrator and cyanide plant. Superintendent McPhee says the Wizard vein is being drifted on at the rate of 5 feet a day.

W. C. Bass, superintendent of the Maxwell mine, near Sumpter, states that the mill has resumed after undergoing repairs. A winze is being sunk from No. 15 to No. 18 level, a distance of 300 feet, while work is being continued on No. 15. The Maxwell carries sulphide ore.

H. H. Ames of the Morning mine, Greenhorn, states that his company has commenced operation of their mill, a 5 foot Bryan, and two tables. With this equipment ore will be treated from the upper levels.

GRANT COUNTY.

The Helenora Con. M. & M. Co. of Alamo is a newly incorporated mining company. The property of the new company is near Alamo. The incorporators are L. W. Waugh, J. E. Stewart and H. E. Hendryx.

SOUTH DAKOTA.

PENNINGTON COUNTY.

The Lakota G. M. & R. Co. is reopening the Grizzly Bear mine, near Hill City. The mill has been entirely removed, and will be replaced with a combination stamp and cyanide plant.

LAWRENCE COUNTY.

The Hidden Fortune 60-stamp mill, on Whitewood creek, below Deadwood, is running full capacity on the low-grade ore from the siliceous belt, mined on North Lead hill. The company is mining ore on the Durango for delivery at the mill. Arrangements have been made at the Durango whereby the St. Patrick, Sula and other adjacent claims may be worked from one point. A tramway has been built by the company, so equipped that sixteen ore cars may be loaded on the Burlington track without shifting them. Sinking has resumed in the Bingham shaft of the company where the hoisting plant was burned last winter. The hoisting machinery has been replaced. The shaft is 280 feet deep of three compartments. The timbers were destroyed to a depth of 150 feet by the fire and these have been replaced. At the 300-foot level a crosscut will be started on the Bingham vein.

The Gold Eagle M. Co. has been organized at Lincoln, Neb., by R. O'Neill, C. Y. Smith, G. M. Smith, J. P. Hymer, with J. Hawgood, Terry, S. D., manager, and J. C. Noland, Maitland, superintendent. The company has taken over 130 acres of mineral land near Maitland, adjoining the Penobscot M. Co., and is north of and 3 miles distant from the north line of the Homestake. The ore is free milling.

UTAH.

BEAVER COUNTY.

The Gold Run M. Co. has been incorporated at Salt Lake City by J. C. Dick, C. DeMelsey, A. R. Tierman. The company owns a group of fifteen claims in Bradshaw district.

Work has been resumed in the Old Hickory tunnel of the Majestic C. Co., near Milford, with twelve men, and the electric drill is cutting out 3 feet per day. The tunnel will reach a connection with the new shaft this week, says Superintendent Osborne. Both at the Old Hickory and the O. K. the electric drills are said to be working satisfactorily.

At the Majestic C. Co.'s smelter near Milford, the period of construction work is nearing completion, says Manager W. A. Farish of Salt Lake City. The dust chamber, 250 feet in length, is being built, while the trestlework will be finished next week. In the meantime the directors

propose to build a line of railway between the O. K. and Hickory and the smelter, and another between the Harrington-Hickory-Vicksburg group and the plant, a distance of 16 miles.

IRON COUNTY.

The Colorado Fuel & Iron Co. is reported to have thrown up its principal options on iron mines near Cedar City, owned by the estate of T. Taylor; J. C. Cutler Jr. manager.

All right, title and interest of the Ophir M. & M. Co. to the Ophir group of claims at Stateline, including all improvements, was sold at sheriff's auction to the Detroit Trust Co. for \$105,577. The milling plant at the Ophir mine is said to have cost \$100,000 and is equipped to treat ore by cyanide process after a slight roasting. The ores carry values in gold and silver.

JUAB COUNTY.

J. Dern, a director of the Lower Mammoth mine, near Eureka, says the work of sinking the shaft is finished to the 1200-foot level and a station is being cut at that point.

The Illinois M. Co., north of Eureka and adjoining the Raymond M. Co.'s ground, have given an option on their mines to F. J. Westcott of Salt Lake City.

PIUTE COUNTY.

(Special Correspondence.)—The Mount Baldy M. & Water Power Co. was organized in Marysville this week. The company is composed of J. Patton, New York City, president; R. De Witt, vice-president; C. P. Barnson, Junction, Utah, secretary and treasurer; D. L. Page and S. J. Robbins, with the officers, as directors. The company has a group of claims 3 miles south of Ten-Mile creek, and about 12 miles from Marysville, where a large porphyry belt extends through the country. The veins are fissures and samples taken indicate satisfactory results. In silver the values run from a trace to 167 ounces. In gold, \$2 40 to \$228.40. The company has bought a quarter section of land on the Sevier river on which they will erect an electric power plant to furnish power for milling purposes. A boarding-house, bunkhouse and assay office will be erected and a large force of men employed. R. De Witt will have charge of the development work and J. Bowers the assay department.

It is reported that G. F. Dalton of Salt Lake has a bond and lease on the Wedge property and will begin operations.

The Iron mine east of town continues to ship two cars of iron ore daily. Superintendent King reports the ore body developing and the values improving. Added facilities are being made to increase the output.

L. Nelson of Richfield has taken a 1000-foot contract on the Snow Bird, situated on Brigham peak.

H. L. Glenn and C. V. Gilmer of Salt Lake, Utah, have a bond and lease on the Dalton mine on Bullion creek.

The mountains east of Beaver are the scene of another gold excitement. The discoveries are near Blue lake at the foot of Mt. Baldy. S. Reinhardt brought down the samples and reports this week. There is abundance of water for milling purposes and plenty of timber. The discoveries are 5 miles from Gold mountain.

The four mining districts surrounding Marysville, the Ohio, Mt. Baldy, Gold Mountain and the Sevier River, are active this year, which promises to be a productive one. These districts can be reached by the Denver & Rio Grande Western Railway from Salt Lake City, which has its terminus at Marysville.

S. F. Mount, who has a bond and lease on the L. & M. group, near Marysville, expects to begin shipments next week.

Marysville, June 21.

SALT LAKE COUNTY.

The capacity of the Utah Con. M. Co. smelter at Murray, says Manager R. H. Channing, will be increased by 300 tons per day. At present the plant is handling an average of 515 tons daily. The work of enlargement will not interfere with the operation of the present furnaces and the usual output of copper, gold and silver bullion will be maintained.

Negotiations for a sale having fallen through, the owners of the Dewey mill in Bingham canyon, near Bingham, will reopen it for operations, says Manager R. Bemis of Salt Lake City.

Twenty acres of ground of the West Mountain Placer M. Co. have been leased to the Utah Co., operating the Wall group at Bingham. This will be used as the site for the proposed concentrator of 500 tons daily capacity, says Manager D. C. Jackling. In addition to leasing the land, the copper company has bought the pumps put in by the placer company, having a capacity of 1500 gallons a minute. They also have an option on the entire placer holdings of the West Mountain Co.

SUMMIT COUNTY.

N. Treweek, manager of the Wahash mine at Park City, reports the main shaft

down 600 feet, and from this point 5000 feet of underground workings have been run, which consists of crosscuts, drifts, upraises, etc. At present they have thirty men at work prospecting and developing this portion of the mine. Two veins of ore are showing.

At Scott hill, near Park City, ore shipments have been resumed by the Scottish Chief mine.

W. H. Crockett and W. A. Dennis are driving a tunnel on the Harwood group, in McHenry canyon, near Park City.

Manager M. Somer of the Portland-Park M. Co. says arrangements have been made to start development work on their group at Park City.

TOOELE COUNTY.

Shipments of quicksilver are being made from the Sacramento M. Co.'s retorts at Mercur.

Superintendent C. Rich says the continuity of its ore-bearing veins in the Indianapolis group, near Stockton, having been determined, the company will tap them through a tunnel, and have begun driving from a point down in the gulch, and it is estimated that they will have to go 700 feet to cut the ore at 700 feet on the dip.

UTAH COUNTY.

By "quit claim deeds" to the Sunday Lode M. Co. have been conveyed the Sunday lode mining claims on Miller hill, in American Fork canyon, near Provo.

State Coal Mine Inspector G. Thomas estimates that the number of men employed in the Utah mines of that class aggregate 3500 men, and that the daily output is 6500 tons, says the Deseret News.

WASHINGTON COUNTY.

Manager Beveridge of the Dixie mines and smelter, near St. George, says the company has decided to enlarge their smelter, which they expect to do this season. Additional ore bodies have been opened up underground.

WASHINGTON.

FERRY COUNTY.

W. F. Newton, manager of the mines of the Mineral Hill Con. M. Co., at Danville, says additional machinery will be put in. The company owns thirteen lode claims. The company also owns the Morrison placers, of 182 acres, on the west side of Mineral hill. A double-compartment shaft will be sunk 300 feet, and for that purpose a 60 H. P. hoist, and a 5-drill air compressor and power drills will be used.

Manager M. R. Staught reports work resumed on the Peacemaker and Eureka Fraction claims, near Republic, and he will begin sinking a shaft. These claims adjoin the Quilp on the southeast.

LINCOLN COUNTY.

The management at Spoken of the Crystal mine, near the mouth of the Spokane river, near Davenport, report they will have a 60-ton smelter ready for blowing in by Aug. 15th. J. Gray, superintendent of the mine, will have charge of the smelter. It is intended to smelt ore not only from the Crystal, but for other mines in that section, including the Deer Trail.

STEVENS COUNTY.

Near Kettle Falls, the Columbia River M. Co. are shipping ore to the smelter.

WISCONSIN.

GRANT COUNTY.

W. S. Grant, of the State Geological Survey, with a party of six men, is making a survey of the lead and zinc section of southern Wisconsin, beginning at Platteville.

WYOMING.

CARBON COUNTY.

(Special Correspondence.)—The shaft on Mohawk claim of the Chicago-Venture M. Co., near Battle lake, is down 150 feet and a station will be started before July 1. Native copper shows in foot wall. The Mohawk has a contact vein showing 11 feet of leached gossan and is said to be similar to the Ferris-Haggarty ore. Grand Encampment, June 22.

FOREIGN.

AUSTRALIA.

NEW SOUTH WALES.

Sydney reports give the gold yield of New South Wales during May at 10,832 ounces, valued at £39,921. The yield for the first five months of 1903 was 85,096 ounces, valued at £311,577.

QUEENSLAND.

Brilliant Block Gold Co., at Charters Towers, give the estimated value of bullion from the company's cyanide works for month of May at £640.—Brilliant Central Gold, at Charters Towers, crushed during May 2925 tons of quartz for yield of 2443 ounces of gold; value of cyanide

bullion, £2074.—Mungana (Chillagoe) May output was 2001 tons of ore, containing 96½ tons copper, 15,072 ounces silver and 325 tons lead.

WEST AUSTRALIA.

The Associated Northern Co., at Kalgoorlie, has ordered a reduction plant for the Iron Duke lease. The new mill comprises Gates crushers, ball mills, and a desulphurizing furnace.

Diamond drilling is still carried on in the Iron Monarch, another of the company's blocks, east of the Brownhill. The first borehole put down from the surface to a depth of 1040 feet passed through 30 feet of payable oxidized ground, and a second hole is being drilled to confirm this.

BRITISH COLUMBIA.

The Ivanhoe mine's flume, near Sandon, has been repaired and the concentrator started up again, shipments also resuming.

The Iron Dollar claim, south of the Oro Denoro, in Summit camp, Boundary district, has been bought by the Oro Denoro, Ltd. Considerable work has been done on the Iron Dollar and there is a showing of copper. R. H. Anderson, superintendent of the Oro Denoro, has men doing railway work. The company is also quarrying ore. Two spurs from the C. P. R. will be run into the quarries on the Denoro, from which shipping ore can be taken.

Manager Rogers of the Nickel Plate group in the Similkameen, near Keremeos, says they will put in a complete electric plant to light the mines, mill, etc., and furnish power.

Kaslo reports say F. Marquis and G. Gilbert claim to have made a gold quartz find on the Gold Park group of two claims on Poplar creek, a tributary of the Lardo river, the claims being 20 miles from Lardo and 1 mile from the railroad.

After being out sixteen weeks the coal miners at Ladysmith have given up the strike and agreed to resume work immediately under the contract existing before the start of the trouble. The men have abandoned the Western Federation, which has furnished little or no support, many now being on the verge of starvation. It is expected the miners of Cumberland will take the same course.

The Snowshow mine, near Phoenix, has 100 men on the payroll. When coke can be had at the Boundary Creek smelter in sufficient quantity more men will be used and an increased tonnage started. The output amounts to 500 tons daily. Ore is being shipped from several parts of the mine, including the new Glory hole, near the end of No. 2 railway spur. On the main incline shaft the work of timbering to the third level and below is finished and rails laid for the 2-ton skips. The 150 H. P. electric hoist is ready for use and is expected to be in operation by July 1. This week shipments were started from the Jumbo mine, near Rossland, says M. R. Galusha, managing director.

J. D. Bone, of the Case Investment Co., of Tacoma, has taken a boring plant into the Nikola district, near Ashcroft, to prospect for oil.

W. Thompson, consulting engineer for the Victory-Triumph Co., is preparing for further operations at the Victory-Triumph group on Sophie mountain, near Rossland. A shaft will be sunk on the Triumph fraction. Previous development consisted of a drift on the vein within the Victory lines.

The output of coal from the Morrissey mines of the Crow's Nest Pass Coal Co. is being increased, and it is expected will by July 1 reach 1000 tons daily. Coal bins, to contain slack coal for manufacturing into coke, will be built at the upper end of the coke ovens. They will be so arranged that lowries can be run in under them to be filled with coal and drawn to the ovens. These bins are being built large enough to contain the supplies of coal for not only the 250 coke ovens, but also for the 500 additional ovens proposed.

CANADA.

ALBERTA.

At Blairmore two coal mines are operating, says the Rossland Miner. The International Coal & Coke Co. has twenty men at work and has arranged to build several coke ovens for testing the coal. Proctor & Fishburn are mining two cars of coal per day.—In Frank the Canadian-American Coal & Coke Co., under Superintendent Geho, is taking out a car of coke daily. Thirty-four men are at work opening up the old tunnels and sinking near the townsite. Arrangements are being made to open up a ledge a mile northwest of the town. Previous to the recent slide the company was producing 20,000 tons per month for the Canadian Pacific Railway.—Near Frank a French company under Manager J. Fleutot is operating with 100 men and firebrick is being shipped in to build coke ovens.—Eight miles east of Frank are the Byron Collieries, Ltd., owned by London and Paris parties. A spur has been built to

the Canadian Pacific Railroad and the company is working thirty men. No machinery is yet in position, but it is expected the mines will be equipped and coke ovens built.

PHILIPPINE ISLANDS.

The Phillipsburg (Mont.) Mail says from Bagio, Benguet, J. D. Hartwell writes that a strike of gold ore was recently made 2 miles from there. The ore is pyritic and the lead 40 feet wide. Average samples assayed \$18 in gold. J. Turrell is working the mine. There are several copper prospects near there that carry gold values and 10% copper.

KLONDIKE.

Dawson advises say the hydraulic plants put in last summer in the Klondike district are proving satisfactory. On Fox gulch the Anglo-Klondike M. Co., owning a large area, in three weeks during May handled more dirt than 200 men could wash out in a year under ordinary conditions. A block of ground 205 feet long, 150 feet wide and 30 feet deep was worked out, yielding good returns. The entire plant is operated by four men, using water under 125-foot pressure. Sluicing is maintained day and night, says Manager G. Coffey. The cleanup will not be made until the end of the summer. Other plants have been shipped north this spring for installation near Dawson.

MEXICO.

CHIHUAHUA.

Parral camp is now producing 50,000 tons of ore monthly, which would be increased if cars to transport it could be furnished.

At Santa Eulalia the Chihuahua M. Co. has laid a pipe line to its mines and put in a large pumping plant.

A lease and bond on the Fourth of July mine, near Parral, has been given to the Saginaw M. & M. Co., who will sink 200 feet. This mine adjoins the Two Republics.

It is claimed that oil has been found on the Batopita river, in the western part of Chihuahua.

The Stillwell Mining Companies, I. Ragaz manager, have commenced work on the Germania mine in Parral district. An option was taken on this property recently by the Stillwell Companies. The property consists of 45 pertenencias adjoining the Refugio mine.

MEXICO.

Another strike is reported by the Belen M. Co., near Ocampo, and operations have resumed at the mill.

SAN LUIS POTOSI.

Los Charcos M. Co., composed of Monterey men, has bought the Oriental mine near Los Charcos. The mine is 10 miles from the nearest railway, and the ore carries silver and copper. The property is an "antigua," and the present owners have a 40-foot shaft sunk on the vein. It is intended to make three levels before the shipment of ore is begun. E. W. Pitt, at Los Charcos, is superintendent.

SINALOA.

(Special Correspondence.)—The Minas del Tajo at Rosario has 600 men at work, 85 of whom are in the 60-stamp mill. The mill handles 160 tons of ore per day. The ore carries gold and silver. The pulp from the batteries is run into settling tanks which take out the coarser portion, the slimes being run off into larger settling tanks. From the tanks the settled pulp is shoveled into pan amalgamators by Mexicans, after which it is run onto concentrators. The mine has been worked to depth of 650 feet, the ore body being 300 feet wide, and containing occasional lenses of high-grade ore. The company is sinking the shaft in the hanging wall country to tap the ore zone at 1000 feet in depth, and they are down 700 feet. J. Bradbury is manager.

Rosario, June 20.

SONORA.

The Alsacia M. Co. are to erect a smelter near their mines in the Ajo mountains. J. Herman, of Herman & Newitt, is at the mine. He is making a thorough analysis of the ore to determine the kind of furnace necessary. The mines are on the northwest slope of the range and about 25 miles from Cananea.

The following summary of the output of the Green Con. Co. Cananea smelter and concentrators for the month of May is given by the Cananea Herald: Tons ore smelted, 26,322; pounds of copper produced, 4,167,127; cost per pound, 6 cents; total construction cost, \$69,700; tons of ore milled at concentrator, 10,507; mining cost per ton, \$1.12; tons concentrates produced, 3797; total paid for labor, \$195,000.

The Alonso Morgado mine, near Carho, has been sold to J. R. Arohibald for \$25,000.

TAMAULIPAS.

The Waters-Pierce Oil Co. has a con-

cession, with an exemption from State and Federal taxation for seven years, for the erection of a plant at their refinery in the port of Tampico, for the extraction of paraffine from crude petroleum. The company will invest \$100,000.

PERSONAL.

J. D. COPLIN has returned to Denver, Colo., from Kansas City, Mo.

L. W. VIDLER has returned to Georgetown, Colo., from Denver, Colo.

A. BENTON of Parra, Chihuahua, Mexico, was in Denver, Colo., last week.

J. N. GREGG of Redding, Cal., is in San Francisco, Cal., on mining business.

C. P. COLLINS of Bradford, Pa., has returned from a trip to Denver, Colo.

THOMAS DERBY of the New Almaden quicksilver mines is in San Francisco, Cal.

R. CHAUVENET of Denver, Colo., is examining mining property near Phoenix, Ariz.

T. RILEY, of Peal, Larimer county, Colo., has returned there from Denver, Colo.

F. L. EWING, a mining man of Yuma, Ariz., is in San Francisco, Cal., on business.

J. C. CAMPBELL, interested in mines near Nevada City, Cal., is in San Francisco, Cal.

W. C. HOWARD has returned to San Francisco, Cal., from placer mines in Columbia, S. A.

M. P. STRONG of Pueblo, Colo., is examining mines on Bullion creek, Plute county, Utah.

C. W. BARRY is superintendent of the Big Five M. Co., at Howardsville, San Juan county, Colo.

M. HICKEY, owner of the Azurite group of mines near Prescott, Ariz., is in San Francisco, Cal.

SYDNEY REEVES has returned to San Francisco, Cal., from the Gambetta mine, at Grub Gulch, Cal.

S. FISHER, superintendent of the Golden Gate mine, near Sonora, Cal., is visiting in Los Angeles, Cal.

W. B. MILLIKEN is manager of the F. M. Davis Iron Works Co.'s metallurgical plant at Denver, Colo.

F. H. CLARK of the Trade Dollar Extension Co. is in Salt Lake City, Utah, from Silver City, Idaho.

J. BRADBURY is manager of the Minas del Tajo, at Rosario, Sinaloa, Mexico, vice A. F. Grigsby, resigned.

F. M. MURRAY of the Franklin M. Co. is at Marysville, Utah, looking after the interests of his company.

S. WILLEY, interested in mines near Rochford, S. D., returned last week from an extended visit in Illinois.

E. L. WHITE of Boston, Mass., president of the Bingham Con. C. Co., is at the mines at Bingham, Utah.

C. E. KNOX, manager of the Montana-Tonopah M. Co. has returned to Philadelphia, Pa., from Tonopah, Nev.

J. J. BROOKS has resigned as superintendent of the Bannie mine, near Prescott, Ariz., and will go to California.

W. H. ANDERSON of Aspen, Colo., is superintendent of the Bassick mine, near Silver Cliff, Custer county, Colo.

W. H. HOLDERMAN has accepted a position as assayer with the Henry Bradburn M. Co., at Marysville, Utah.

H. H. NICHOLSON, M. E., of Denver, Colo., has returned from examining mines in the Black Hills, South Dakota.

C. H. TAYLOR is consulting engineer for the Victoria C. M. Co., with mines at Victoria, Ontonagon county, Mich.

G. K. FISCHER, constructing engineer of the Utah Con. C. Co. of Bingham, Utah, is in Colorado Springs, Colo.

G. H. ROBINSON, manager of the Tintic M. & Dev. Co., has returned to Salt Lake City, Utah, from Chicago, Ill.

G. RICHARDS is superintendent of the Puntner mine, near Sonora, Tuolumne county, Cal., vice H. J. Dykes, resigned.

A. E. DRUCKER, assayer and mill superintendent at the Minas del Tajo, at Rosario, Sinaloa, Mexico, is in San Francisco, Cal.

G. L. KAEDING, E. M., of San Francisco, Cal., is in Jackson county, Or., examining mining properties. On his return

he will spend several weeks in Shasta and Siskiyou counties, Cal., visiting properties there in which he is interested.

A. F. GRIGSBY has resigned as manager of the Minas del Tajo, at Rosario, Sinaloa, Mexico, and has gone to San Francisco, Cal.

C. A. BURCHAM, part owner of the Yellow Aster M. & M. Co., at Randsburg, Kern county, Cal., is in San Francisco, Cal.

PRESIDENT A. B. LEWIS of the Royal G. & C. Co., operating near Milford, Utah, returned this week from a short trip East.

J. P. EVANS of the Colorado Iron Works, Denver, Colo., has returned to Denver from San Francisco, Cal., via Los Angeles.

H. M. CROWTHER of Salt Lake City, Utah, managing director of the Blue Acre C. Co. of Beaver, Utah, is traveling in California.

MANAGER T. F. KELLY of the Arizona Hydraulic M. Co. is at the mines near Old Glory, Santa Cruz county, Ariz., from Chicago, Ill.

F. I. CAIRNS is in Houghton, Mich., from Bridgeport, Conn., to assume charge of building the smelter for the Copper Range Con. Co.

B. F. GRAHAM of Bisbee, Ariz., president of the Bisbee Queen C. Co., has gone to Kansas City, Mo., and Chicago, Ill., on company business.

SUPERINTENDENT BABCOCK of the Equitable mine, in Flower district, near Virginia City, Nev., has resigned and gone to San Francisco, Cal.

J. BROOKS of Park City, Utah, is superintendent of the Sheba mine, south of Mill City, Humboldt county, Nev., vice J. C. Hessel, resigned.

W. J. LAWRENCE returned last week to Salt Lake City, Utah, after inspecting developments on the Lawrence Con. in Elmore county, Idaho.

W. H. ALDRIDGE, manager of the Canadian Smelting Works at Trail, B. C., returned last week from a visit to Ottawa and Montreal, Canada.

M. R. STAIGHT, manager of the Peacemaker-Eureka group of mines near Republic, Wash., returned last week from a business trip to New York.

W. F. SNYDER, president and manager of the Glasgow & Western Exploration Co., returned to Salt Lake City, Utah, last week, from a trip East.

J. H. JACOBSON, president of the Latham M. Co. of Spruce Mountain district, Nev., returned from camp to Salt Lake City, Utah, last week.

H. K. WHEELER of Los Angeles, Cal., has returned from a two weeks' trip in Arizona, where he has been examining gold and copper properties.

A. H. DANFORTH, formerly with the Colorado Fuel & Iron Co. of Denver, Colo., is manager of the Hidden Fortune M. Co., near Deadwood, S. D.

J. T. MORROW has resigned as superintendent of the smelter at Great Falls, Mont., and has gone to Cananea, Sonora, Mexico, for the Cananea Con. C. Co.

D. C. JACKLING of Salt Lake City, Utah, manager of the Utah Co.'s Bingham mines, made a short business trip to Anaconda and Butte, Mont., this week.

H. G. NICHOLS has resigned as assistant superintendent at the Standard Con. M. Co., at Bodie, Cal., to take charge of the Republican mine, near Jacksonville, Tuolumne county, Cal.

W. H. THOMAS, consulting engineer for the B. C. Copper Co., owning the Mother Lode mine and smelter at B. C., after spending two months in the district, has returned to New York.

H. T. POWER, superintendent of the Hidden Treasure drift mine, Placer county, Cal., has been appointed by Governor Pardee of California a trustee of the State Mining Bureau, vice F. G. Drum, resigned.

R. P. JARRIS, E. M., for the past three years superintendent of the Compania Metalurgica de Torreon in Mexico, and formerly assayer of the Bi-Metallic Smelting Co. of Leadville, Colo., has been appointed professor of mining in the New Mexico School of Mines at Socorro, N. M.

Books Received.

"Solar Heat" is the title of a pamphlet of 160 pages by Charles H. Pope, A. M. It deals with the history of the utilization of solar heat, from the days of Archimedes

to the present. The volume contains numerous illustrations and is an interesting treatise on the practical and economical application of the heat of the sun to industrial usages.

Catalogues Received.

"The Diamond Drill and Its Work" is the title of a handsomely illustrated and valuable pamphlet on the above subject issued by the American Diamond Rock Drill Co. of 95 Liberty St., New York City. It contains a record of work accomplished with their drills, the adaptability of the diamond drill and a price list of the various types and sizes of machines.

The Crocker-Wheeler Co., manufacturers and electrical engineers, Ampere, N. J., in an interesting little pamphlet of 16 pages, entitled "The Source of the Electric Light," show a complete line of electric light and power generating plant equipments. The descriptive matter enumerates the requirements of a commercial electric current and the important features in the design and construction of such machinery.

The Stillwell-Blerce & Smith-Valle Co. of Dayton, Ohio, in their "General Pump Catalogue, No. 53, 1903," issue of 114 pages, show an extensive line of air and circulating pumps, boiler feed pumps, compound and condensing pumps, power pumps (duplex and triplex), electric, geared, heavy pressure and hydraulic pumps, heaters, filters and purifiers, and Victor turbines. It is finely illustrated and contains, also, various tables of capacities and other specific information necessary to hydraulic calculations.

Commercial Paragraphs.

THE American Engineer & Foundry Co. of 433 Mateo St., Los Angeles, Cal., report that they are manufacturing the Lane slow-speed improved roller mill.

THE F. M. Davis Iron Works Co. has opened an ore testing plant and metallurgical department at 1737-39 Champa St., Denver, Colo. W. B. Milliken is manager.

THE Economist Gas Engine Co., of San Francisco, Cal., report shipping last week two gas engines for pumping plants—a 10 H. P. to San Jose, Cal., and a 23 H. P. to Winters, Cal.

THE Union Gas Engine Co. of San Francisco, Cal., report shipping last week a 5 H. P. geared hoist to Hilsdale, Ariz. They also report a 5 H. P. ship's hoist for shipment to Alaska.

THE Elaterite Roofing Co. of San Francisco, Cal., report shipping a carload of roofing to Tonopah, Nev.; also a carload of the same material to Pocatello, Idaho, to be used on mine buildings.

THE Mine & Smelter Supply Co., Denver, Colo., write that they have orders for a large hoisting and pumping plant for Pearl, Colo., also four Huntington mills and a set of 14x27 Davis rolls for Leadville, Colo.

THE Sullivan Machinery Co. of Chicago, Ill., has issued a handsome wall hanger in tints, illustrating the various types of machinery manufactured by them, including air compressors, rock drills, hoisting engines, diamond drills, etc., each of which is handsomely illustrated in its several types. The descriptions are printed in both English and Spanish.

THE Ingersoll-Sergeant Drill Co. of New York state the Cleveland Stone Co. has recently placed with them an order for a compressed air plant, which will be located at the stone company's No. 6 quarry, North Amherst, Ohio. The building will be 80x130 and the plant complete will cost \$130,000. The plant will comprise two large Ingersoll-Sergeant Corliss condensing air compressors, 48 inch stroke, semitangye frames, having a combined capacity of 9215 cubic feet free air per minute. Steam and air ends are compounded and of the highest refinement in economy throughout. Also, three Stirling water tube boilers, 258 rated H. P. each, to carry 180 pounds working steam pressure; two independent jet condensers, two duplex boiler feed pumps, two duplex auxiliary low-service pumps, three Roney mechanical stokers, one fan draft, water purifier system, etc., including some 10,000 feet of large air pipe and fittings as the main feeder around the quarry. This plant will give a cubic foot of air at less cost, they say, than any other plant in the world, and it is to be a notable one in many ways. It is expected to be in operation by September next. Among the machinery to

be handled are nine powerful hoisting stations, handling twenty-two derricks, fifteen channelling machines, fifteen rock drills, pumps, blacksmith fires, steam hammer, grindstone and shop engine. So many radical changes over the whole system of quarrying are in contemplation that it may be expected to increase the output 25% to 50% with the same labor force, cut down the coal consumption two-thirds and cheapen the cost of production to a very material extent.

Notice of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

SPHERICAL PIPE JOINT AND STUFFING-BOX—No. 731,159. June 16, 1903. W. F. Boardman and F. H. Jackson of San Francisco, Cal., said Jackson having assigned to Byron Jackson of the same place. This invention relates to an improvement in what are known as "ball" or "spheroidal" joints for pipe couplings; and it consists in the application of a stuffing-box whereby a tight joint may be maintained in this class of joints whatever turn or change of angle may be made and means by which two spherical segments of the joint may be held together while the gland may be removed and the packing adjusted.

EDUCATIONAL DEVICE—No. 731,175. June 16, 1903. J. T. Coodman of Alameda, Cal. This invention relates to improvements in mechanical devices for facilitating study in numbers, letters, word construction and the like on the part of little children. Its object is to provide a simple, entertaining, indestructible and inexpensive means for presenting subjects of study to the beginner in lieu of the ordinary text books.

THEATRICAL STAGE—No. 731,094. June 16, 1903. H. W. Bishop, San Francisco, Cal. This invention comprises the combination with the stationary portion of the stage, of a revolvable central portion upon the same plane, with means for setting scenery so that a plurality of settings for different scenes may be arranged upon the table. In conjunction therewith are means for revolving the table so as to bring any desired scene to the front, means by which the accessory portions of the stage both above and below the main level may be revolved in unison with the revolvable floor of the stage, and means for connecting electrical wires between the stationary and movable portions.

LIFE BOAT LAUNCHING APPARATUS—No. 731,143. June 16, 1903. S. H. Ury, San Leandro, Cal. The object of this invention is to provide a simple means by which a boat may be lowered gently, safely and rapidly. It comprises the combination in a life boat launching apparatus, of upright supports secured rigidly to a ship's rail, with having curved portions pivoted to said uprights, means for holding the ways vertical, boat-supporting shoes embracing the ways and slidable thereon, pivoted boat-supporting bracket arms on said uprights, means whereby the boat may be transferred from the bracket arms to the ways, spring-actuated brake bars hinged to the outer ends of said ways and means for supporting the ways when in inclined position from the sides of the vessel.

OIL BURNER—No. 731,133. June 16, 1903. F. Saffell, Fresno, Cal., one-half assigned to R. J. Powers of San Leandro, Cal. This invention is especially designed for the burning of heavy unrefined petroleum oil in conjunction with steam, and a means for supplying and mixing the steam and oil before it reaches the point of ignition. It consists in an apparatus adapted to be employed in conjunction with stoves or like-heating apparatus, and comprises a device for furnishing the steam, a device into which the steam thus furnished and oil are delivered, and a means for intimately mixing the steam and oil before they arrive at the point of ignition.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific coast inventors:

FOR THE WEEK ENDING JUNE 16, 1903.

- 731,011.—GRAINING MACHINE—B. W. Augustine, Alameda, Cal.
- 731,094.—THEATRICAL STAGE—H. W. Bishop, S. F.
- 731,157.—CAN BODY MACHINE—H. L. Black, Oakland, Cal.
- 731,325.—BAIT BOX—N. B. Anchet, Pendleton, Or.
- 731,159.—PIPE JOINT—Boardman & Jackson, S. F.
- 731,285.—HYDRAULIC RAM—H. Culpan, Alms, Or.
- 731,169.—EXTRACTING METALS—O. A. Ellis, El Dorado, Nev.
- 731,175.—EDUCATIONAL DEVICE—J. T. Coodman, Alameda, Cal.
- 730,910.—CAR COUPLING—G. C. Harlin, Seattle, Wash.
- 731,364.—TRACTION APPARATUS—A. A. Honey, Tacoma, Wash.
- 731,365.—TRACTION APPARATUS—A. A. Honey, Tacoma, Wash.
- 731,189.—HORSE CHECK—S. W. M. & G. L. Kollock, Tacoma, Wash.
- 730,934.—FURNACE FEEDER—J. C. Leary, S. F.
- 731,311.—RULE OR SCALE—W. F. Leavell, Castile, Wash.
- 731,380.—BOILER—L. I. S. Mayhew, Whatcom, Wash.
- 730,954.—GATE LATCH—O. E. McEwen, Lowell, Wash.
- 730,949.—FISH TRAP—Miller & Wallace, Fairhaven, Wash.
- 730,957.—WRENCH—A. Newell, Pasadena, Cal.
- 731,320.—SAND GUARD FOR RAILROADS—J. P. Newell, Portland, Or.
- 731,589.—ALCOHOL HEATER—E. R. Plummer, Los Angeles, Cal.
- 731,130.—WELL—M. D. Rochford, Los Angeles, Cal.
- 731,133.—OIL BURNER—F. Saffell, Fresno, Cal.
- 731,084.—REFLECTOR—H. H. Taylor, San Jose, Cal.
- 731,329.—CAN OPENER—H. Till, Tucson, Ariz.
- 731,143.—BOAT LAUNCHING APPARATUS—S. H. Ury, San Leandro, Cal.
- 731,355.—GAS REGULATOR—C. C. Wilson, Alameda, Cal.

Latest Market Reports.

SAN FRANCISCO, June 26, 1903.

METALS.

SILVER.—Per oz., Troy: London 24½d (standard ounce, 925 fine); New York, bar silver, 52½c, refined (1000 fine); San Francisco, 52½c; Mexican dollars, 41½c San Francisco, 41c New York.

COPPER.—New York: Standard, \$14.75; Lake, 1 to 3 casks, \$14.50@14.75; Electrolytic, 1 to 3 casks, \$14.50@14.75; Casting, 1 to 3 casks, \$14.00; San Francisco: \$14.00. Mill copper plates, \$17.00; bars, 18@24c. London: £56 7s 6d spot per ton.

LEAD.—New York, \$4.12½; Salt Lake City, \$3.50; St. Louis, \$4.00; San Francisco \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 5½, sheet 6, bar 5½c; pig, \$4.75. London: £11 15s 0d per long ton=2.75c per lb.

SPELTHER.—New York, \$6.25; St. Louis, \$4.85; London, £19 5s 0d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

ANTIMONY.—New York, Cookson's, 9½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 10c; 300 to 500 lbs., 11c; 100-lb. lots, 13@15c.

TIN.—New York, pig, \$28.12½@28.27½; San Francisco, ton lots, 29½c; 500 lbs., 30c; 200 lbs., 30½c; less, 31c; bar tin, 32½c @35c. London, £127 spot.

PLATINUM.—San Francisco, crude \$18.00 ½ oz.; New York, ingot, \$19.00 per Troy oz. Platinum ware, 75@80c per gram.

QUICKSILVER.—New York, \$44.50@46.00; large lots, London, £8 15s; San Francisco, local, \$45.00 ½ flask of 7½ lbs.; Denver, \$49.50. Export, \$43.50.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 35c; Eclipse, 37½c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 30c to 3½c.

SOLDER.—Half-and-half, 100-lb. lots, 19½c; San Francisco, Plumbers', 100-lb. lots, 16c.

NICKEL.—New York, 50@60c ½ lb.; ton lots, 45@48c.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$19.85 @20.25; gray forge, \$18.60; San Francisco, bar, 3c ½ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$29 50@30.50; open hearth billets, \$31.50; San Francisco, bar, 7c to 12c per lb.

CHICAGO CURRENT QUOTATIONS.

Bessemer.....	\$21.00@21.50
Foundry Northern 1.....	20.50@21.00
Northern 2.....	20.00@21.50
Northern 3.....	19.50@20.00
Southern 1.....	19.85@
Southern 2.....	19.35@
Southern 3.....	18.85@
Forge.....	18.35@
Charcoal.....	24.00@24.50
Billets, Bessemer.....	31.50@32.00
Bars, iron.....	1.75@
Bars, steel.....	1.75@ 1.80
Rails, standard.....	28.00@30.00
Rails, light.....	34.00@40.00
Plates, boiler.....	1.90@ 2.00
Tank.....	1.75@ 1.80
Sheets, 26 store.....	2.90@ 3.00
No. 27.....	3.00@ 3.10
No. 28.....	3.00@ 3.10
Angles.....	1.75@
Beams.....	1.75@
Tees.....	1.80@
Zees.....	1.75@
Channels.....	1.75@
Steel melting scrap.....	16.50@17.00
Relaying rails.....	29.00@30.00
Dealers forge.....	14.50@15.00
No. 1 railroad wrought.....	17.50@18.00
No. 1 cast, net ton.....	15.00@15.50
Iron rails.....	22.00@23.00
Car wheels.....	21.00@22.00
Cast borings.....	6.00@ 7.00
Turnings.....	12.00@13.00

LUMBER.—(Retail): Pine, ordinary sizes, \$20.00@22.00; extra sizes higher; redwood, \$22.00@23.00; lath, 4 feet, \$4.25 @4.50; pickets, \$19.50; shingles, \$2.35 for No. 1 and \$2.00 for No. 2; shakes, \$13.50 for split and \$14.50 for sawed; rustic, \$26.00 @32.00.

CEMENT.—Germania, \$2.50 @ 2.75; Hewmoor, \$2.90; Trowell, \$2.90; Portland, \$2.50@2.75 per bbl.

LIME.—Santa Cruz, \$2.25; Roche Harbor, \$2.25 per bbl.

GENERAL SUPPLIES.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton,

15½c. No. 1** 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2* 35%, carload lots, 9½c; less than one ton, 11½c. No. 2** 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2 per keg.

CAPS.—3x, \$5.50 per 1000; 4x, \$6.50; 5x, \$8; Lion, \$9, in lots not less than 1000.

FUSE.—Triple tape, \$3.60 per 1000 feet; double tape, \$3.00; single tape, \$2.65; Hemp, \$2.10; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

OILS.—Linseed, boiled, bbl., 51c; cs., 56c; raw, bbl., 49c; cs., 54c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw, bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 20½c; Astral, 20½c; Star, 20½c; Extra Star, 24½c; Eocene, 23½c; Elaine, 26½c; Water White, in bulk, 14½c; Mineral Seal, iron bbls., 18½c; wooden bbls., 21c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 17c; do., cs., 23½c; 86° Gasoline, bulk, 21c; do., cs., 27½c; 63° Naphtha or Benzene, deodorized, in bulk, per gal., 16c; do., in cs., 22½c; Lard Oil, E. W. S., bbl., \$1.00; cs., \$1.05; Neats-foot Oil, pure, bbl., 75c; cs., 80c; Sperm, crude, 50@60c; Natural White, 65c; Bleached do., 70c; Whale Oil, cs., 50@55c.

CANDLES.—Granite 6s, 16 oz., 40s. 10½c ½ set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 24@25c ½ lb.; carloads, 23@24½c; in tins, 35c; soda ash, \$2.00 ½ lb. 100 lbs.; hyposulphite of soda, 24@25c ½ lb.; caustic soda, in drums, 3@3½c ½ lb.; Cal. s. soda, bbls., \$1.25@1.50 ½ lb. 100 lbs.; sks., \$1.05; chlorate of potash, 12@13c; nitrate of potash, bbls., 10c; caustic potash, 10c in 40-lb tins; borax concentrated, 7@8c ½ lb.; roll sulphur, 4@6c; powdered sulphur, 2@3c; flour sulphur, French, 2@3c; alum, \$2.00@2.25; California refined, 2@2½c; sulphide of iron, 9c ½ lb.; copper sulphate, 5@7c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 2½c ½ lb.; nitric acid, in carboys, 8c ½ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., per lb., 6½c; in 25-lb. tin pails, ¾c per lb. above keg price; in 1 and 5 lb. tin cans, 100 lbs. per case, ¾c lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6c; do. in kegs, 6½c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 6c; less than 500 lbs., 6½c.

LITHARGE.—Pure, in 25-lb. bags, 8 @9c per lb.

BONE ASH.—Extra No. 1, 5@6c per lb. No. 1, 4@5c.

BORAX.—Concentrated, 7@9c per lb powdered, 9@12c; fused, 25@30c.

BORAX.—Crystal, 7c; calcined, 25c.

MANGANESE.—Pure, ½ lb., 60c.

MOLYBDENUM.—\$2 per lb.

CHROMIUM.—(90% and over) per lb., \$1.00.

BISMUTH.—Subnitrate, per lb., \$1.60.

SODIUM.—Metal, ½ lb., \$1.00.

MERCURY.—Bichloride, ½ lb., 90c.

PHOSPHORUS.—(American) ½ lb., 75c.

SILVER.—Chloride, ½ oz., 90c@1.00; nitrate, 55c.

ALUMINUM.—No. 1, 99%, small lots, 37c ½ lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

URANIUM.—Oxide, ½ lb., \$3.50.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., .04c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lots, Eastern and foreign: Wallsend, \$6.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$3; Cumberland, \$12; Cannel, \$9.00; Welsh Anthracite, \$11.50; Rock Springs, \$9.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13 in sacks; Sunnyside, \$8.50, long ton.

(These prices are wholesale, f. o. b. San Francisco, unless otherwise noted.)

Obituary.

J. P. MUNSON, a pioneer mining man and surveyor, died June 16 at Placerville, El Dorado county, Cal. Deceased was born in New York, October, 1824. Though an orphan at nine years of age, by working his way he made the most of high school and academic opportunities there, and later went to the lead mines at Dubuque, Iowa, afterwards to the Lake Superior copper mines. Coming in 1852 to El Dorado county, Cal., he engaged in surveying, mining and teaching, and served three terms as Superintendent of Schools. He is survived by a widow and two sons.

SITUATIONS WANTED.

A MINE SURVEYOR, AN ASSAYER AND Analytical Chemist, with a thorough acquaintance with the cyanide process and a graduate of a leading mining college, is open to engagement. The best of references furnished. Address Box 558, Los Angeles, Cal.

A YOUNG MAN WITH 12 YEARS' PRACTICAL mining experience wants position where the ability to do things and doing them will lead to advancement. Can assay, survey, run engine or pumps, sharpen tools, or do anything about a mine. Bave some mill experience. References given. Address R. J. S., care of this office.

ASSAYER OR SURVEYOR. TECHNICAL graduate with considerable experience at present located in Coeur d'Alenes, desires permanent position after June 20th. References. Address Geo. A. Snow, Mullan, Idaho.

ASSAYER AND CYANIDE MILLMAN desires position. References Address "Assayer," care of Mining and Scientific Press.

CAPABLE ENGINEER OF GOOD STANDING and experience would like to purchase an interest in an established engineering business—mining or civil. Only a business capable of expansion and doing high grade work is desired. Address "Experience," care of Mining and Scientific Press.

EXPERIENCED ASSAYER, ANALYST AND Draughtsman desires position with mine, mill or smelter. Excellent references. Speaks Spanish. Address "Metallurgist," this office.

FIRST-CLASS METALLURGICAL CHEMIST and Assayer desires position. Can furnish best of reference, etc. Address C. W. L., this office.

MECHANICAL ENGINEER—HAVE A UNIVERSITY education and am an all ar. and practical mechanic. Four years experience in steam and hydraulic engineering; have designed an up-to-date blast furnace; have been connected with large copper mine for two years; good references. Prefer large gold or copper mine; foreign country preferred. Address A. B. C., care Min & Sci Press.

MINE SUPERINTENDENT WANTS POSITION with a substantial company that has a mill on property. A qualified mining engineer who can run a mine or mill, cyanide plant, assaying and surveying. Address "Mining," this office.

MINING MAN OF 14 YEARS' EXPERIENCE. Thoroughly familiar with modern mining methods. Expert mill, cyanide and chlorination man. References. Address B., this office.

MINING ENGINEER, 26, GRADUATE MINING Department University of California; for past thirteen months employed by one of largest mines in Mexico as head assayer and chemist, also mill assistant; after took charge of 60-stamp mill and hacienda. Has had some experience in mining, cyaniding, surveying, drafting, and good experience in pan amalgamation. Best of references from both general manager and superintendent where last employed. Address 1666 Page St., San Francisco.

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One 4½x2½x6-in. Single Acting Blake Pump (outside packed).

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ASSESSMENT NOTICES.

MARINA MARSGANO GOLD MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 4th day of June, 1903, an assessment (No. 36) of ten cents per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 415 Front street, San Francisco, California. Any stock upon which this assessment shall remain unpaid on the 1st day of August, 1903, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 31st day of August, 1903, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.
CHAS. BOVONE, Secretary.
Office—415 Front street, San Francisco, California.

EUREKA CONSOLIDATED DRIFT MINING COMPANY.—Location of principal place of business, San Francisco, California; location of works, Placer County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 15th day of May, 1903, an assessment (No. 37) of one-half (½) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 214 Pine street, San Francisco, California. Any stock upon which this assessment shall remain unpaid on the 20th day of June, 1903, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on SATURDAY, the 11th day of July, 1903, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

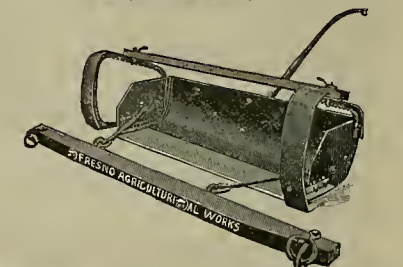
By order of the Board of Directors.
GEO. W. DIXON, Secretary.
Office—Room 31, 214 Pine street, San Francisco, California.

POSTPONEMENT.

The date of the delinquency of the foregoing assessment (No. 37) has been postponed to SATURDAY, the 11th day of July, 1903, and the day of sale from the 11th day of July, 1903, to TUESDAY, the 28th day of July, 1903. By order of the Board of Directors.

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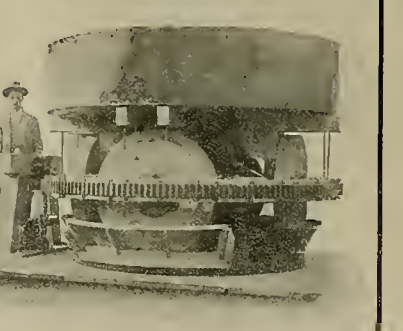
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R. H. RENNIE, Resident Agent, 201 Continental Building, Denver, Colo.

A. A. SPARKS, 38½ Government St., Victoria, B. C.

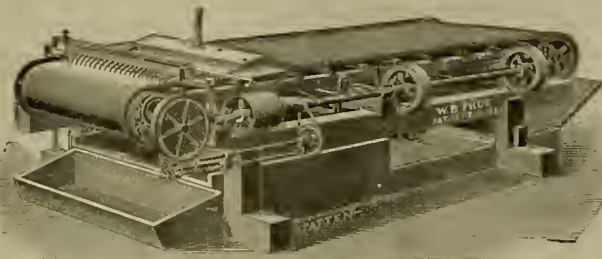
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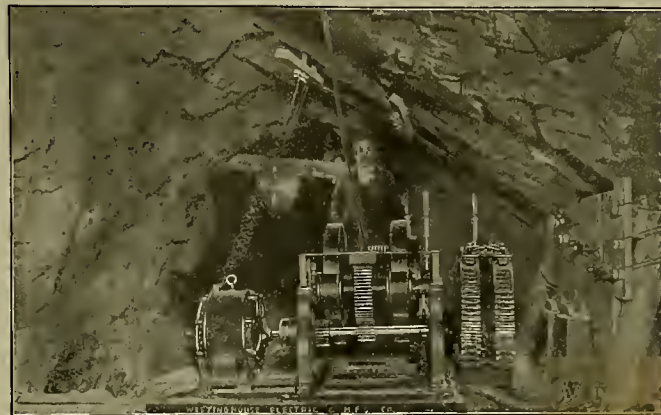
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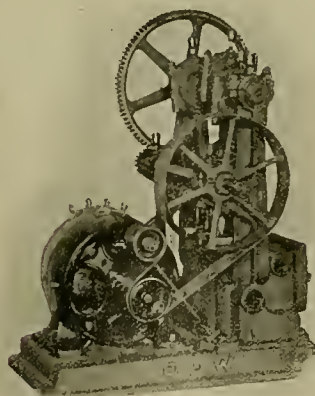
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INDEX TO VOLUME LXXXVI

OF THE

Mining and Scientific Press

FROM JANUARY TO JUNE, 1903.

	PAGE.
Abating the Smoke Nuisance.....	50
Ability of Man and Machine.....	211
Abrasive Materials, Classes of.....	3
Acceleration of Velocity.....	83
Accidents Due to Combustion in Air Compressors.....	284
Acid, Cyanic.....	314
Non-Effect on Gold and Platinum.....	407
Proof Cement.....	319
What It Is.....	195
Acquiring Mineral Rights on Railroad Land.....	147
Activity of Mining.....	275
Actual Horse Power.....	226
Adams, J. H.....	311, 358
Adams Lake Series, B. C.....	348
*Adaptability of Canada Cam.....	300
Additional Labor Troubles.....	378
Adjoining Placer Claims, Assessment Work.....	277
Advance in Mining and Scientific Progress.....	17, 34
In Price of Copper.....	62
Advertisements by Fraudulent Mine Promoters.....	285
Advancement in Cyaniding.....	34
Advertising Mines for Sale.....	329
*Aerial Tramway.....	106
*Tramway at Grand Encampment, Wyo.....	162, 183
Tramway Operation.....	83, 136, 166
Aeriform Bodies.....	227
Africa, Gold-Bearing Alluvials.....	277
African Mines.....	142, 206, 222, 291, 342, 389, 403
Age of Chalcid Bricks.....	296
Of Gold in Mines.....	257
Drills and Engines.....	286
For an Air Compressor.....	28
Haulage Plant.....	81
*Heater for Smelting Furnace.....	74
Receivers for Compressor.....	286
Resistance to Flywheel Rotation.....	40
Tight Drift.....	276
To Operate a Drill.....	303
Agents' Location.....	146
Agitation Tank.....	385
*Agitator for Oil Wells.....	320
Agglomerate and Conglomerate Distinct.....	51
Aid in Mining.....	178
*Air Blast.....	169
Compressed.....	300
Compressed, Motor Haulage.....	407
*Compressor.....	90, 202, 266
Compressor, Accidents Due to Combustion.....	284
Compressor, Effect of Altitude on.....	286
Compressor, Friction in.....	296
Compressor, Shut-off Valve on Main Line.....	393
*Compressor, Unloading Means for.....	3-5
*Compressor Valve.....	26
Compressors Operating Power Drills.....	63
Alabama Mines.....	67
Alameda Co., Cal., Pyrites Deposits.....	117
Alarm Bell in Hoisting Engine Room.....	179
Alaska Mines.....	11, 27, 43, 59, 75, 91, 107, 123, 135, 155, 171, 187, 203, 219, 235, 251, 266, 287, 306, 329, 354, 370, 386, 400, 415
*Copper River District.....	360, 365
*Sea Level Mine.....	297
Southeastern Mineral Resources.....	315
Treadwell Mine Costs Compared to South Africa.....	329
Aliens and Mining Locations.....	163
Alkaline Reagent in Cyaniding.....	4
All-Fire Method for Assay of Gold and Silver in Blister Copper.....	110
Allis-Chalmers Co.....	32, 64, 80, 126, 160, 176, 272, 285, 311
*Allison Ranch, Cal., Mine.....	69
Alloys.....	407
*Alluvial Deposit, Measurements Relating to.....	406
Gold-Bearing, West Africa.....	277
Almaden Production of Quicksilver.....	103
Altitude, Reduction of Atmospheric Pressure at.....	277
Effect of on Condenser.....	179
Effect on Compressors.....	286
Indicated by Barometer.....	185, 213
Indicated by Thermometer.....	314
Aluminum.....	347, 393
Alloy.....	51
As an Electrical Conductor.....	259
Methods.....	42, 211
Amador Co., Cal., Miners' Strike.....	242
Amalgam.....	214
From Stamp Batteries, Dirty.....	277
On Concentrating Tables.....	67
Plates, How Dressed.....	243
Recovery of Gold From.....	195
Retorte Bursting.....	277
*Amalgamating Apparatus.....	36, 394
Auriferous Sulphide.....	69
Plates.....	19, 65
With Steam Stamps.....	259
*Amalgamation of Gold Ores.....	36, 53, 68, 84, 65, 100, 116
*Machine.....	267
Methods.....	8, 22, 131, 195, 259
*Amalgam.....	133
Amended Location.....	347
Amendment to Mining Law.....	90
American Institute Electrical Engineers.....	387, 411
Capital in Mexico.....	300
Diamond Rock Drill Co.....	404
Engineering Works.....	32
Institute Mining Engineers.....	37, 99
Method in Manufacturing.....	59
Museum of Natural History.....	314
Negro for the Rand.....	255, 310
Smelting and Refining Co.....	211
Spiral Pipe Works.....	374
Standard Boiler Horse Power.....	363
Steam Gauge and Valve Co.....	239
Ammonia-Cyanide Process of Treating Copper, Nickel or Zinc Ore Containing Precious Metals.....	389
Analysis of Igneous Rocks.....	409
Aneroid Barometer, Use of.....	179
Angle of Hillside Slope.....	99
Angleite.....	314
Annealed Copper.....	67
Annealing Manganese Steel.....	362
Anniversary.....	348
Annual Report, Gwin Mine.....	348
Labor, Record of Unnecessary.....	376

*This mark indicates that the article indexed is illustrated.

	PAGE.
Another Milestone.....	406
*Anthracite Region, Hoisting Water in.....	283
Mines, Life of.....	210
Antimonial Gold Ore.....	379
Antimony.....	3, 314
Elimination of From Copper Matte.....	212
Ore Reduction.....	314, 347
Native.....	3-7
*Apex and Side Lines.....	37, 99
Of Vein.....	147, 227, 383
*Apparatus for Producing Caustic Soda.....	10
*Concentrating.....	353
*For Burning Oil Fuel.....	267
*For Changing Winding Ropes in Mines.....	218
*For Charging Blast Furnace.....	399, 414
*For Crushing and Sorting Ores.....	301
*For Extracting Metals From Ores.....	385, 399, 414
*For Extracting Precious Metals.....	234
*For Forming Blast Furnace Charges.....	154
*For Generating Steam From Hot Slag.....	106
*For Hanging Up Stamps.....	353
*For Hoisting or Lowering Material.....	122
*For Making Sulphuric Acid.....	365
*For Precipitating.....	353
*For Precipitation of Metal From Solutions.....	399
*For Receiving and Handling Molten Material.....	154
*For Refining Zinc Spelter.....	301
*For Removing Drill Tools From Wells.....	399
*For Separating and Concentrating.....	334
*For Treating Impurities in Furnace Gases.....	267
*For Treating Ores.....	30, 287
*For Treating Rock Asphalt.....	399
*For Treatment of Gold or Other Ores.....	285, 320
Application for Mining Claim Patent.....	277
For Mechanical Patent.....	296
*Of Permanganate Process.....	133
Arbitration in Labor Troubles.....	210, 226
Archaean Geological Formation.....	51
Arctic, Albert.....	135
Argenta, Mont., Rock Specimens.....	347
Argonaut M. Co. vs. Kennedy M. Co.....	1, 169, 242
Arizona & Sonora Mfg. Co.....	178
Arizona Legislation.....	162, 407
And Utah Boundary.....	114
Mines.....	11, 27, 43, 59, 75, 91, 104, 107, 123, 138, 153, 155, 171, 187, 203, 216, 235, 241, 251, 266, 287, 305, 321, 339, 354, 370, 386, 400, 415
Statehood.....	33
Topographic Mapping of.....	263
*Yavapai Co., Noted Mines of.....	394
Arkansas Mines.....	303, 354, 415
Armor Plate Hardened.....	35
*Armstrong Universal Ratchet.....	154
*Cutting Off Machine.....	302
*Tool Holders.....	397
Arrangement of Batteries in Large Gold Mills.....	19, 194
*Of State.....	113
*Arrastra, Usefulness.....	145
*Arrastras at Guanajuato, Mexico.....	145
Arsenic.....	99, 362
Elimination of From Copper Matte.....	212
Production.....	398
Arsenical Ores, Treatment of.....	198
Arsenides, Platiniferous Test for.....	296
Articles, Technical, Writing of.....	318
*Artificial Pressure for Hydraulic Lifting.....	116
Ashes.....	3
Ascending Hot Waters, Ore Deposition by.....	363
Aspen, Colo., Treatment of Oxidized Silver-Lead Ores.....	276
Assay of Gold and Silver in Blister Copper.....	113
From Diamond Drill Cuttings.....	393
Samples.....	63, 115, 147
Tob.....	33, 170, 383
Assaying Cyanide Solutions.....	233, 317, 370, 393
Not a Son.....	4
Assayers, Their Uses and Abuses.....	146
Assays of Lead Ore.....	325, 335, 347, 349
Assessment on Oil Claims.....	146
Work.....	67, 99, 146, 195, 275, 347, 407
Atkins, D.....	146
Atmospheric Pressure, Reduction at High Altitudes.....	277, 286
*Attachment for Winding Shaft, for Dumping Car Doors.....	385
*For Rock Drills.....	218
At What Depth Do Wet Mines Become Dry?.....	326
Augsburg Nürnberg Mfg. Co.....	338
Auriferous Zone of Georgia.....	149
Conglomerates.....	69
Sulphide Amalgamation.....	69
Auriferous, and a General Theory of Gold Ore Genesis.....	362
Austin Mfg. Co.....	32, 326
Australian Mines.....	46, 47, 63, 95, 126, 142, 174, 207, 254, 271, 291, 342, 347, 357, 403, 418
*Mining Practice.....	263
*Automatic Oiler for Mining Cars.....	19
Feeding in Stamp Mill.....	42
*Hammer, Griffiths.....	19
*Ore Loader.....	136
*Ore Sampling, Notes on.....	367
*Tailings Sampler.....	410
*Tripping Device.....	116
Average Duty of Miners' Lamps.....	237
Per Cent of Copper in Ore.....	123
Price of Metals in Denver, Colo., in 1902.....	8, 22
Avoiding Loss of Mercury.....	347
Avoidupolis Pound.....	347

B

Back Number Superintendents.....	195
*Backward, Looking.....	330, 331, 332
Bailing With Skips.....	227
Ball Stamp.....	347
Ballou, F.....	207
*Band Fastener for Tanks.....	153
*Bar, Mining Column.....	285
Barbed Wire Fence Telephone Line.....	379
Barite.....	105
Barium Aluminate.....	195
Oxide.....	237
Barnhart, A. D.....	3, 346
Barometric Indication of Altitude.....	195, 213
*Bartlett, C. O., Snow & Co.....	80, 111, 116, 128, 233, 403
*Bartlett & Snow Dryer.....	409
Barta.....	99
Electrolytic Reduction of.....	395
Bates, Use in Spanish American Placers.....	277
Battery Arrangement in Large Gold Mills.....	259
Capacity of.....	72
Concrete Foundations for.....	72
Requisites Best Determined by Experiment.....	35
Screen's Incline.....	35
*Stamp Stem Guide.....	365
Storage.....	347
Water Required for Five Stamps.....	19
Water, Temperature of.....	19
Batters, Vibration in.....	411
Baume.....	367
*Beach Mining With Surf Washer.....	364
Beams Supporting Loads, Strength of.....	19, 407
Bear Gulch Tin District, South Dakota.....	196
Bell Ranch, San Miguel Co., N. M., Rock Specimens.....	362
Signs, Arizona, No Code.....	497
Belt Concentrators.....	385
Cement for Leather.....	236
Power Transmission.....	51, 163
Shifter Position.....	195
Tension.....	193

C

*Belting, Hints on.....	231, 350
Belts, How Best Treated.....	102
Weight.....	293
Bench of the No. 1 Gold Fields.....	182
*Bendigo, Australia, Gold Milling Practice.....	283, 286
*Mining.....	364, 381
Bending Copper and Brass Pipes.....	163
Besly, C. H., Co.....	207
Bessemer Process.....	362
Best Mfg. Co.....	120
Bigelow, G. A.....	169
Binder, Carl.....	300, 201
Bingham District, Utah.....	286
Bismuth and Lead, Melting Points.....	216
Bits for Oil Well, Making of.....	316
*Black Hills, S. D., Cyaniding in.....	413
Ore Deposits.....	212, 213
Black Slag and Treated for Gold.....	179
Coating on Nuggets.....	131
Powder, Differences in.....	179
*Black's Permanganate Process.....	133
*Blast Furnace.....	58, 74, 154, 170, 277, 320
*Apparatus for Charging.....	399, 414
Furnace Capacity.....	19
*Furnace Hearth.....	395
*Furnace, Pipe Stove to Heat Blast for.....	353
*Furnace Tug.....	301
*Furnace Tube.....	334
*Stove.....	334
Blasting in Shafts.....	147
By Knox System.....	35
*Cartridge.....	154
Blow at Fake Promotions.....	406
Blower and Exhaust Fan.....	383
Blowpipe Determination of Minerals.....	131
Blue Print Writing.....	5
Bog Iron Ore.....	243
Boiler Horse Power.....	362
Safe Working Pressure.....	277
Scale Preventive.....	362
*Room Economy.....	284
Temperature and Gauge Pressure.....	347
*Tube Cleaning.....	165
Boiling Point of Water at Different Altitudes.....	213, 314
Boilers, Zinc in.....	379
Bolivian Mines.....	357
Bonus Offered by Chilean Government for Copper Production.....	83
Book Notices.....	15, 46, 96, 112, 128, 144, 160, 176, 307, 323, 330, 338, 344, 375, 404, 419
Books on Petroleum.....	407
Borax.....	179
*Boring Bar.....	217
Nome Tundra for Gold.....	132
With Hydraulic Motor.....	131
Bouery, P.....	243
Boundary Stakes on Mining Locations.....	296
*Josh Place for Blast Furnaces.....	26
Boss, M. E.....	65, 72, 102
Boston & Montana vs. Pennsylvania Case.....	2
Bradley, W. W.....	52
Brake Horse Power.....	227
Braun, F. W., & Co.....	80, 239, 293
Brazil, Diamonds in.....	277
Gold.....	278
Brazilians, Platiniferous Test for.....	296
*Breakage of Stamp Stems.....	102
Breaking of Pillow Block.....	243
Breckenridge, Colo., Specimens.....	362
Breese, O. S.....	166
Bretherton, S. E.....	212
Brewer, W. M.....	315
*Briquette Making Machine.....	42
Briquette, Fine.....	296
British Columbia, Adams Lake Series.....	346
Coal Industry.....	63
Lead Refining.....	134
Mines.....	14, 15, 31, 47, 63, 79, 95, 111, 127, 143, 158, 159, 174, 175, 190, 206, 222, 233, 236, 254, 271, 272, 291, 309, 310, 324, 325, 342, 343, 357, 374, 399, 403, 419
Mining Association.....	97, 162
Mining in.....	301
Mining Law.....	3
Mining Location.....	405
British Possessions, Quicksilver in.....	206
British Guiana Mines.....	206
Brittle Copper.....	67
Broken Hill Mines, N. S. W., Manganese in.....	362
Bromine Process.....	365
Bromine in Combination With Metals.....	243
Process.....	245
Process for Recovery of.....	333
Bromo-Cyanide Process.....	393
Brown Corlies Engine Co.....	176, 224, 292, 311, 314, 356
Brown, H. F.....	336
Browne, R. S.....	57, 233
*Brushing, Frug Vanner.....	129
Brushes of Carbon or Copper Gauze.....	216
*Bucket Dumping Apparatus.....	216
*Dredge Headstall.....	259
*For Water Wheel.....	353
In Shaft Sinking.....	211
Buff & Buff Mfg. Co.....	293
*Buffalo Pitts Road Locomotive.....	9
*Bumping Table, Colorado.....	393
Bunker Hill-Lost Chance Decision.....	242
Bureau of Mines and Mining.....	407
Burners for Oil.....	356
Burnham-Standford Co.....	356
*Burning Coal Dust.....	25
Bursting of Amalgam Retorts.....	277
Business of Gathering and Selling Mineral Specimens.....	211

Cambria, Cal., Rook Samples.....	329
M. Co.'s Pumping System.....	51
*Cambrian Ore Deposits in Black Hills.....	212, 213
Cam, Canada, Adaptability of.....	300
*Cambridge Mill, Colorado.....	231, 247, 266, 282
Canada, Gold Ores of Ontario.....	383, 397
Canadian Mines.....	79, 127, 143, 158, 160, 223, 291, 310, 343, 374, 386, 419
Patents.....	165
Cananea Copper Mines.....	152
*Geology of.....	352
*Canada Cam, Adaptability of.....	300
Canton Steel Co.....	332

	PAGE
*Method of Freezing Ground for Excavating or Tunnel Work.....	170
*For Determining Amount of Copper in Ores.....	248
*Of Classifying the Ore in a Mine.....	238
*Of Covering Mats.....	170
*Of Extracting Gold From Ores.....	374
*Of Extracting Noble Metals.....	334
*Of Extracting Zinc.....	58
*Of Making Hydrogen Sulphide.....	58
*Of Making Sulphuric Acid.....	388
*Of Mapping Exposed Ore Bodies.....	196, 197
*Of Mating or Fritting Smelting.....	357
*Of Purifying Blast Furnace Gases.....	174
*Of Reducing Metallo Oxides.....	74
*Of Reducing Ores.....	58
*Of Testing Molybdenite Ore.....	232
*Of Treating Ores.....	41, 202, 322
*Of Tunneling.....	414
Method of Amalgamation.....	8, 22
Of Mining Coal.....	170
Of Modern Mining.....	212
Of Obtaining Daily Samples in Headings.....	212
Metric Ton.....	379
Mexican Mining Law.....	51, 99
*Duty on Explosives.....	412
Mine Locations.....	51, 101
*Mining Methods.....	170
Mines.....	15, 31, 47, 83, 93, 95, 111, 127, 133, 159, 161, 175, 190, 191, 234, 293, 338, 354, 372, 391, 392, 310, 356, 372, 383, 401, 416
*Patio Process.....	193
Mexico, American Capital in.....	300
Micoa, Market for.....	314, 329
*Mine, Custer City, South Dakota.....	181
Various.....	163
Micaceous Hematite.....	313
*Mietz & Weiss Kerosene Engine.....	413
Engine Works.....	
Michigan College of Mines.....	3
Mines, 13, 45, 61, 78, 93, 109, 135, 141, 157, 173, 185, 189, 199, 204, 211, 237, 253, 270, 299, 308, 323, 356, 372, 383, 401, 416	
Midsummer Measurements of Streams of California.....	284
Milestone, Another.....	406
Mill Heating by Live Steam.....	83
*Lumber Seasoned.....	347
*Shift.....	35
*Stamp.....	394, 395
*Tailings.....	51
*Tailings for Concrete for.....	212
*Mining at the Camp Bird, Colo.....	231, 247, 266, 282
*At Tonopah, Nevada.....	338
*And Amalgamation of Free Gold Ores, 38, 53, 68	
*Equipment of the Melones M. Co., Melones, Cal.....	50, 52
Ore, Charges for, in Stamp Mills.....	195
Milled.....	196
Millrite.....	
Millsite Locations.....	51, 115
Mine Advertising.....	329
*And Mill of the Ophir Con., San Miguel Co., Colo.....	129, 135
Bell Signals.....	55, 194
*Car Operated Door.....	121
Cars, Friction in Moving.....	54
Cars, Rail for.....	87
*Cage.....	122
*Failures, Causes of.....	295
*Gate.....	58
Haulage.....	227
Inspectorship.....	17
Lease, Form of.....	246
Legal System.....	81
Life of.....	210, 333
Locations.....	3, 19, 35, 67, 99, 115, 131, 146, 147, 195
Managers' Duties.....	376
Management.....	176
*Material, Strength of.....	62
*Model or Exhibit.....	330
Proton.....	330
Pump, Capacity.....	330
Reports for the Investor.....	276
Sampling.....	21, 130, 165
Shaft Ventilation.....	19
Signals.....	131
Storekeeper.....	86
Surveys, Value of.....	344
Switzerland.....	195
Taxation.....	17, 34, 129, 278
Temperature.....	179
Timber Framing.....	131
Timbers, Life of.....	177
Timbering, Cost of.....	244
*Timbering, Examples of.....	249
Undeveloped, a Venture.....	212
*Ventilating Machinery.....	122, 339, 352
Ve. Mill Samples.....	226
Working Coats.....	131
Workings Filled With Waste.....	99
Mine & Smelter Supply Co.....	176, 328, 390
Miner and the Law.....	382
And the Carbonyl.....	406
Mining.....	135
Miner's Duty on Lead.....	278
And Metallurgy at St. Louis Exposition.....	374
*Of Cherry Creek, Cal.....	257, 262
*Of Placacho Basin, Cal.....	257, 260
*Of Tonopah, Nevada.....	275, 279
Valuation of.....	114, 409
Wet and Dry.....	33
Miners Learning by Travelling.....	147
Of Lead.....	278
Miner's Inch.....	178, 237
Inch of Water, Price of.....	131
*Lamp.....	56, 414
*Tool.....	287
Mineral Collection in New York Museum.....	314
Carrying Gold.....	147
Classification of, by Land Department.....	255
Containing Zinc.....	147
Deposits on Public Lands.....	259
Determined by Blowpipe.....	131
Hardness of.....	115, 131
In Place.....	104
Of Diamonds.....	412
On Railroad Lands.....	147
Reclaiming Lands in From Rock Drill Use.....	310
Resources of United States, 1901.....	67
Specimens.....	289, 393
Specimens, Gathering and Selling.....	211
Veins and Mineralized Zones.....	259
Wool.....	147
Mining Activity, Stimulus of.....	275
*And Metallurgical Patents, 10, 26, 41, 56, 74, 90, 106, 135, 136, 159, 202, 215, 334, 350, 387, 285, 301, 320, 333, 334, 353, 365, 365, 390, 414	
And Scientific Progress.....	17, 326
*And Sme'ting Silver in Mongolia.....	103, 318
Association, B. C.....	97
Bureau Bill.....	146
Capitalization.....	3
Claims.....	51
Claims in Forest Reserves.....	383
Claims, Patent for.....	277
Coal.....	170
*Column Bar.....	285
Co-operative.....	378
*Copper in Upper Michigan.....	185, 199, 214
Costs.....	34, 35, 162, 326
Districts.....	21
*Engineering in the Valuation of Mines.....	223
Experiences.....	4
*Industry of the Cour d'Alenes, Idaho, 5, 6, 23, 37	
*In Bendigo.....	364, 381
*In Hill of Columbia.....	391
In Honduras.....	391
*In Peru, South America.....	345, 319
In the United States.....	194

(Continued from Preceding Page.)

	PAGE.
Mill Arrangement	19, 104
Mill Charges, Amalgamation of	195
Milling and Amalgamation of Free Gold	195
Ores, 33, 53, 68, 81, 85, 100, 116	
* M ¹ Practice at Melones, Cal.	50, 52
Guide	365
As, Br, 33, 53, 68, 81, 85, 100, 116	
Order of Dip	19
Crises, 33, 53, 68, 81, 85, 100, 116	
Ratio for Flaming Up	353
Water and	379
er Required for	19
d Miners' Luch	179
	147
Miner Legislation	114
Shovel	10
Concentration in Pipes, How Prevented	147
Heating Mills	38
ection of, in Pipes	119
ternor Functions	83
on Connection With Steam Sinking	147
Dumps	147
Dips	363
Steel Excavation at San Francisco	163
ope, 33, 53, 68, 81, 85, 100, 116	
on Engine	318
abies	301
ight of	131
	362
dition of Ferro-vanadium to	379
Amalgamation Plate	147
End Mine Workings	147
* Frame	360
Heat Colors	393
Loss of by Friction	411
Manufacture of	2
Overheated	296
lope, Safety Factor of	67
Strength of	368
What Is It	318
Wires in Flat Cables	34
Well-Bierce & Smith-Valle Co. 111, 160, 358, 404	
ouis Exposition	34, 57
trouls of Mining Activity	275
ack Buying	347
Kennewell Mine, San Diego Co., Cal.	131
oping With Machine Drill	245
oping Ore on Others' Property	115
opes, Machine Drilling in	181
orage Battery	347
rekeeper for Mine	86
ove, Hot Blast	334, 338
radley, D. N.	334
ores, Supporting Loads	82
Of Materials in Mines	82
Of Steel Rope	362
rike at Mountain Copper Co., Keswick, Cal.	218
rikes	3
Of Ore at Cripple Creek, Colo.	129
ripping in Gravel Mines	259
Structural Materials, Crushing Strength	407
udy of Amalgamation Methods	8
stitute for Hemp Packing	304
hway Railroad Construction, Oakland, Cal.	137
ction Dredge	21
suggested Mining Method	21
Iron-Teed Bromide-Cyanide Process	333
Ulva, Machine Co.	310, 374, 383
lphane and of Iron	99
lphate of Lime, Test for	19
lphides and Sulphates, Effect of, on Plati-	
um	329
Nail Assay for	314
lphide of Mercury	178
Of Zinc	243
ores, Semimetallic	94
lphur, Combinations of	213
Proportion of, in Ore	211
lphuric Acid, Apparatus for Making	365, 385
Acid on Pacific Coast	3
Acid in Water, How Detected	229
lphuretted Hydrogen as a Gold Precipitant	211
periodical Enrichment of Tailings Dumps	151
perpendents Who Do Not Travel Around	151
pply of Iron Ore	378
orce Rock Altered by Oxidizing	227
Of Tailings Dumps, Enrichment of	243
ur Washer for Beach Mining	364
rvey in North Carolina	355
veys, Up-to-date	329
Value of the Mines	99
ro Tunnel	19
inding the Smelter	314
resh Mines	175, 191
elling Ground, How Kept Open	51, 131
enite	183
Ivanite	329
stem Mining	329
Least	31
Of Train Control	40

Table of Hardness of Minerals.....	15
Tallings Cyaniding in Sierra Co., Cal.....	318
At Ely, Nevada.....	181, 218
Dumps Enrichment.....	243
On Others' Lands.....	115, 179
Sampler for Quartz Mill.....	19
*Sampler, Automatic.....	40
Samplers.....	379
Tamping Bars, Metal.....	313
Nitro Powder.....	211
Tank for Agitation.....	385
Tap Tempering.....	363
*Tappet for Use in Stamp Batteries or the Like.....	301
Tappets Screwed Onto Stamp Stem.....	211
Tasmania Mines.....	63, 175, 207, 293
Mt. Lyell, Ore Treatment at.....	392, 319, 333
Tax in the Transvaal.....	210
Taxation of Mines.....	17, 114, 129, 276
Technical Articles, Writing of.....	313
Technolexicon Compilation.....	35
Telephone Line on Barbed Wire Fence.....	379
Telluride Mill, Colorado City, Colo.....	242
Telluride Ores.....	163, 211, 314
Tellurium, Determination of, in Ores.....	259, 326
Tests for.....	320
Temperature of Battery Water.....	19
Of Deep Mines.....	179, 339
Of Furnace, How Determined.....	73
Temper of Cold Chisel.....	73
Tempering a Tap.....	363
Mine Drills.....	195
Working Parts of Machine Drills.....	5
Tennessee Mines.....	110, 174, 309, 311, 357
Tensile Strength of Twisted Wire.....	19
Strength of Gold.....	19
Tension of Belts.....	393
Tetrachloride of Gold.....	314
*Terlingua, Texas, Quicksilver Deposits.....	33, 39, 174
Test for Cement.....	547
For Carbonic Acid in Water.....	15
For Free in Carbonates.....	227
For Molybdenite Ore.....	223
For Sulphate of Lime.....	223
Testing Cyanide Solutions.....	19

Up-to-date Surveys.....	236
Uranium.....	236
Residues, Treatment of.....	81
Uruguay, S. A., Mining Conditions.....	90
Use of Crude Oil in Gas Engine.....	243
Of Hydrogen Peroxide in Volumetric Analy- sis.....	268
Of Lime as an Alkaline Reagent in Cyanid- ing.....	4
Of Man Engines in Mines.....	142
Of Oil for Fuel.....	21
Of Patent Rights.....	342
Of Sills in Timbering.....	219
Of Steel Chisel on Amalgamating Plate.....	191
*Useful Combination of Processes.....	303
Usefulness of the Air Assayer.....	318
Uses and Abuses of Assayers.....	148
Of Steam Shovel.....	168
Utah Mines, 14, 31, 46, 62, 79, 94, 95, 110, 126, 192, 174, 190, 201, 207, 208, 206, 222, 246, 238, 254, 271, 290, 3, 9, 321, 341, 357, 373, 374, 388, 389, 403, 403, 417.....	370
Unloading Means for Air Compressors.....	138
Utilizing Flushing Water for Boring Rod.....	391

Vacuum Gauge Reading at Elevation.....	378
Valance, What It Is.....	243
Valid Mine Location.....	277
*Valuation of Mines and Mining Engineering.....	238
Valuation of Mines.....	114, 206
Value of Old Mine, Estimation of.....	99
Of Managers' Reports.....	61
Of Mine Surveys.....	316
*Value for Air Compressors.....	24
On Main Line From Air Compressor.....	392
Vanadium.....	9, 31
Van Diest, P. H.....	16
*Variations in Hoisting Machinery.....	9
*Vehicles, Spring for.....	131

• **Y**

Z

Vein, Apex of.....	131, 277
Dipping Out of Shaft.....	3, 243, 277
Enrichment by Ascending Waters.....	313
Veins, Gash.....	314
On Patented Railroad Land.....	243
Velocity of Falling Body.....	216
Of Water in Flume.....	216
*Ventilating Machinery for a Mine.....	238
Ventilation of Mine Shafts.....	19, 349
In Cornish Mines.....	3, 5
In Mines.....	393
Ventilator for Mines.....	12
*Verde Mining District, Arizona.....	70, 71
Vibration in Batteries.....	32, 41
Virginia Mines.....	271
Volcanic Ash.....	95
Regions, Geology of.....	296
Volumetric Analysis, Use of Hydrogen Peroxide in.....	283
Vulture, Ariz., Rock Sample.....	376
W	
Wade & Wade.....	16
* Wall Casing Swsge.....	10
Wallace, C.....	375
* Wallace Steel Crusher.....	21
War Tax in the Transvaal.....	210
Washburn, W. H.....	297
* Washing Pan for Ore.....	353
Washington Mines.....14, 30, 31, 46, 62, 63, 79, 95, 110	
126, 142, 158, 174, 190, 206, 232, 238, 254, 271, 290, 309,	
324, 342, 357, 374, 389, 403, 418.	
* State Creek Camp.....	309
Water, Color of.....	396
Flow of, in Open Channels.....	108
Flowing, Unit of.....	378
For Condensing Engines.....	363
Formula for Measuring.....	243
* Hoisting in Mines.....	263
* Hoisting in Anthracite Region.....	283
In Pipe Line, Weight of.....	81
Pressure, How Found.....	211
Passing Through Orifice, Weight of.....	198
Power, Different Head on Same Pipe.....	277
Pressure.....	147, 363
Price of, Per Miner's Inch.....	131
Required for 5 Stamp Battery.....	19
Rights.....	147
Supply, Expensive.....	276
Supply for Prospectors.....	211
Supply of Santa Barbara, Cal.....	218
Wheel, of.....	175
* Wheel Buckets.....	363
Wheel, Direction of Nozzle.....	42
Wheel, Power Developed.....	277
Wheel, Point of Impact.....	277
Wheel With Motor.....	89
Velocity of, in Flume.....	21
Volume and Weight.....	371
Watts, W. L.....	52
* Weber Gasoline Locomotive.....	14
Weber, Camp & Lane Co.....	273, 31
Weight of Pipe.....	19
Orlth.....	40
Of Belts.....	393
Of Steam.....	13
Of Water.....	378
Of Water in Pipe Line.....	81
* Well Casing Packer.....	58, 243
* Drilling Machine.....	58, 243
Weller, E.....	19
* Wells, Removing Obstructions From.....	278
Were the Nome Gold Fields Previously Worked by Russians?.....	303
Wessel, Chas.....	3
West Africa, Gold-bearing Alluvials.....	277
* Western Australia, Mining in.....	23
Western Engineering & Construction Co.....	201, 207, 40
* Westinghouse System of Train Control.....	23
Electric & Manufacturing Co.....	201, 207, 40
* Weston Electric Measuring Instruments.....	23
Wet and Dry Mines.....	35
Vs. Dry Crushing.....	24
What Is Steel?.....	3
Wheel, Power Developed From.....	21
Why Some Mines Employ Incompetent Miners.....	14
The Prospector Sells.....	36
Wickham, W. H.....	13
Williams, G. E. G.....	5
Wilson W. B.....	36, 33
Windmill for Stamps.....	8
Winding in Stages.....	116, 16
Plants for Great Depths.....	116, 16
Ropes, Safety Factor.....	28
* Shaft of Dumping Car Doors, Attachment for.....	388
Wing Dams.....	13
Wire Rope Tramway Operation.....	83
Screens, Mesh of.....	12
Witwatersrand Gold Fields.....	399, 403, 41
Stamps on.....	371
Word of Warning.....	318
Working Costs of a Mine.....	13
Low-Grade Ore.....	19
Mill Tailings.....	5
Miner's Experience.....	4, 20, 42, 138
Mines Single or Double-handed.....	277
Pressure for Boilers.....	277
Workmen Lien Laws.....	83
World Mapping.....	168
Writing of Technical Articles.....	318
On Blue Prints.....	51
Wulfenite.....	19, 371
Wurzburg Product.....	41
Worming Mines, or Double-handed.....	116, 138, 158
174, 190, 246, 292, 238, 254, 271, 290, 291, 309, 324, 342	
374, 389, 403, 418.	
Y	
Yak Tunnel Finished.....	283
Yale, B. C., Rock Specimen.....	296
* Yavapai Co., Ariz., Noted Mines of.....	294
Yeaman, J. A., & Co.....	176, 31
Yocum, J. W.....	16
Z	
Zinchenle.....	19, 99, 407
Zino, Elimination of, From Copper Matte.....	218
In Bolfers.....	375
* Mines of Kentucky.....	81, 87, 101, 102
Native.....	349
Ore Concentration at the Payne Mine.....	100
Ore, Red, German Inquiry for.....	418
Precipitation, Regeneration of Cyanide Solutions After.....	351
Process of Obtaining.....	13
* Smelting Furnace.....	391
* Spelter, Apparatus for Retting.....	391
Where Mined in the United States.....	391







